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Early Days of the Telephone.

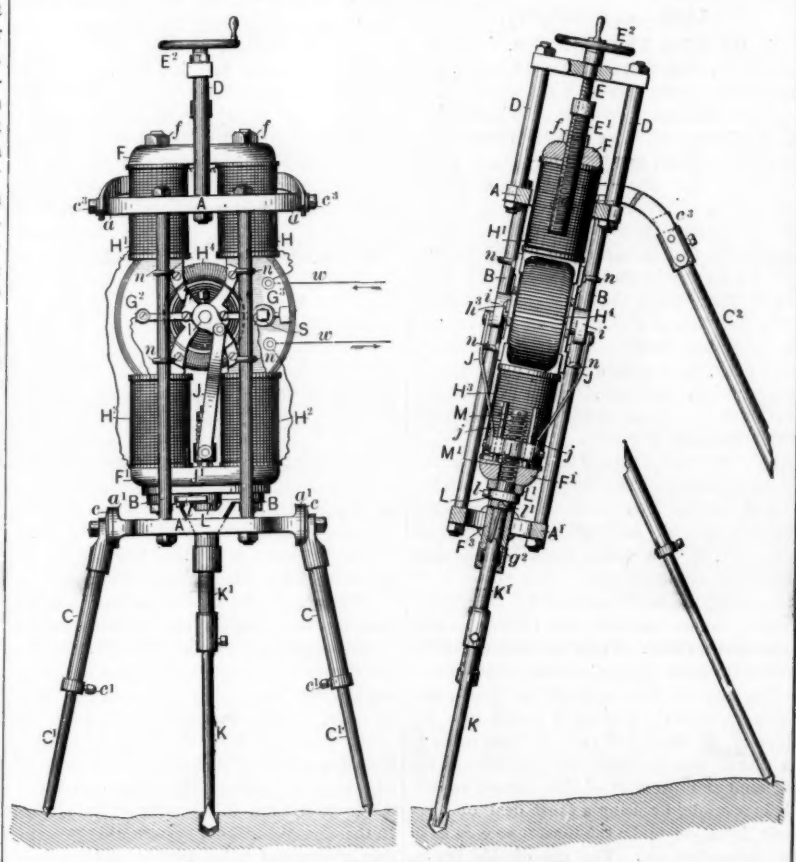
"It was my privilege," remarked Telephone General Manager Sargent, of Brooklyn, to a REVIEW representative, "to be present at the first exhibition in a public way of the speaking telephone, when the crude apparatus first exhibited by Prof. Bell was shown to the Emperor of Brazil, Sir William Thomson, Prof. Elisha Gray, and others, at the Centennial Building one Sunday in the latter part of June, 1876. I well remember the look of astonishment on the Emperor's face when he said he had heard the words, 'To be or not to be?' spoken in an adjoining room, and the nervous, excited way in which Sir William Thomson took the instrument and heard the same words. The simplicity of the principle involved in the instrument was at once patent to the scientific mind of Sir William Thomson, who, in his enthusiasm, published the result of the exhibition immediately upon his return to England, and in this way fatally injured Bell's patents in that country. This is a matter of history, and a source of great regret to Sir William Thomson. The clue having once been given for a talking telegraph, inventors were innumerable who had seen the thing long before. However, I think no unprejudiced scientific or practical mind is prepared to deny the honor due to Prof. Bell.

"Of course at the present time there have been many improvements in mechanical and electrical detail, but the telephone as in use to-day is more nearly like the first instrument produced than any other invention within my knowledge. Its simplicity and utility made its use and development a phenomenon of the 19th century. Companies were organized all over the country, and the business carried on in the hands of people with no electrical experience whatever, and the results, though satisfactory to the promotors, would scarcely stand the criticism of electrical engineers of the present day.

"And it might not be amiss," concluded the genial Sargent, who, by the way, is a thoroughly well-informed telephone man, "to drop a tear or two over the varied difficulties and mysteries encountered by the telephone subscribers of those early days."

A Powerful Galvanic Battery.

Amongst the many claimants for improvements in galvanic batteries we note that Mr Alfred Dun and Herr F. Hasslacher, of Frankfort-on-the-Main, have patented a combination for which they claim the high E.M.F. of 2.5 volts per cell, while, in consequence of the small resistance of the exciting and depolarizing liquids employed, the strength of current is very considerable. Moreover, notwithstanding its considerable power, the element is so constant in its action that it may be used with great advantage for electric lighting, or for driving motors. The new element consists of a carbon negative electrode, having, as depolarizing liquid, nitro-hydrochloric acid (aqua regia), either alone or mixed with ferric chloride. As positive electrode in the other cell zinc is employed, or any other metal soluble in soda lye, or, at any rate, on closing the circuit; and as exciting liquid soda lye of greater or less concentration is used. The chemical action of the element is as follows: The zinc is oxydized by the oxygen evolved, and the oxide formed is dissolved by the soda lye, while the hydrogen is at once taken up by the aqua regia forming hydrochloric acid with its chlorine. In the gradual decomposition of the aqua regia there is produced chlorine, together with chloro-sub-nitrous acid and chloro nitrous acid, which can also give up their chlorine. When the aqua regia is saturated with chlorine, its decomposition ceases, and only begins again with a fresh production of chlorine, or of the two above-named compounds, when the free chlorine first evolved is taken up by hydrogen or any other body that absorbs chlorine, such as ferrous chloride. According to the quantity of hydrogen evolved by the action of the element, the development of chlorine is proportional to the absorption of the existing free chlorine, and this lasts as long as any aqua regia exists. With the presence of ferric chloride the depolarizing process may be considered as consisting in the reduction of ferric chloride to ferrous chloride by the hydrogen, with formation of hydrochloric acid, the ferrous chloride being, however, at once reconverted into ferric chloride by the chlorine of the aqua regia. This takes place as long as there is any trace of the aqua regia present. Only after this has disappeared does a permanent formation of ferrous chloride begin, combined with an increase of resistance in the element. But this does not occur as long as all the iron is present in the form of ferric chloride. It is, therefore, advantageous always to have an excess of aqua regia present. The addition of ferric chloride has, therefore, the important object of enabling the element to be utilized to the fullest possible extent without increasing the resistance, which explains the reason why a mixture of aqua regia and ferric chloride renders the element more constant than when aqua regia alone is used. The addition of the ferric chloride has, however, also the important advantage, that by means thereof a too rapid mingling of the inner and outer liquids is prevented. This is particularly important when a carbon cell is used in place of an earthenware cell, in consequence of the greater porosity of the former. On the ferric chloride mixing with the soda lye in the walls of the porous cell, oxide of iron is formed, which fills up the larger pores without materially interfering with the necessary contact and without increasing the resistance, which is rendered very small by the good conduction of the carbon cell. In addition, the oxide of iron assists the depolarization, and, therefore, also acts beneficially in this respect. As the hydrochloric acid is always formed afresh, it is advantageous to use aqua regia containing much nitric acid, or, in replenishing only to supplement the nitric acid consumed. The very high electromotive force of the element is caused by the fact that to the electric tension between metal and carbon there is also added that existing between the aqua regia with ferric chloride and the soda lye. If it is desired to avoid all smell during working, the hydrochloric acid of the aqua regia may be replaced by chromic acid or a chromate. In this case no production of free chlorine ensues, and any nitrous acid fumes are at once absorbed by the chromic acid. The depolarizing action of the nitric acid will then be assisted by that of the chromic acid. In this case platinum or aluminum may be used in place of carbon.



FIGS. 1 AND 2.—PHELPS' ELECTRIC ROCK DRILL.

The Phelps Electric Rock Drill.

Up to the present time the only power that has been found practical to use in mining is compressed air. The manufacturers of mining machinery understand that in supplying air for a drill which utilizes two and a half horse power, ten horse power must be provided in the engine operating the air compressor. For instance, in equipping a mine to work ten drills of two and a half horse power each, representing twenty-five horse power, a hundred horse power engine is required to compress the air necessary to keep them running, which means a loss of 75 per cent. in the transmission.

When it is remembered that power can be transmitted by means of electricity over an equal distance with a loss not exceeding twenty-five per cent., it immediately becomes apparent that the use of electricity as a motive power in mines would be very economical as compared with compressed air, and when the further facts are considered that the use of compressed air requires large and expensive pipes, requiring much time and labor in their placing, while electricity is carried by simple wires, which are quickly and easily handled, the same wires carrying both light and power, no argument whatever is necessary to convince the most critical that the mining industry presents an open field for electricity as a motive power, and that it is only necessary to provide proper appliances.

Lucius J. Phelps, of this city, the well-known inventor of a system of telephoning to and from moving railway trains, has recently patented an electric rock drill, which seems to meet the demand. Every feature necessary to a successful working drill has been carefully worked out, as will be seen from the following description:

In the accompanying cuts, Fig. 1 is a front elevation; Fig. 2, a side elevation, partly in section.

The frame consists of two oval-shaped yokes, *A A'*, provided with flanges or ears *a' a'*, to serve as points of attachment for the legs or supports of the frame, as well as to strengthen it. These yokes are connected by four rods, *B*, provided with nuts and screws, so that the parts can be readily removed or replaced when desired. The front tubular legs, *C*, provided with bracing ears *c*, are securely clamped to the ends of the lower yoke, *A'*, by nuts and screws in such manner as to permit the legs to be adjusted around their pivots to vary the angle of the legs relatively to the drill. Feet *C'* slide endwise in these tubular legs, and are held at any desired point by means of set screws *c'*, thus enabling the lengths of the legs to be adjusted. The back leg, C^3, is similarly constructed and adjusted. Its upper end, however, forms a fork or yoke, C^2, which is pivoted to the opposite ends of the upper yoke or frame piece *A*, by bolts or clamp screws c^3, which permit its angle relatively to the frame to be varied as required. A gallows frame, *D*, formed with or detachably connected with the upper yoke, *A*, is provided with a telescoping screw, *E*, operated by a hand wheel, E^2. This arrangement is a compact one, giving a large range of adjustment to the drill, while the screw works in a small space. Any portions of the frame which would tend to in-

terfere by their induction with the lines of force of the motor may be made of brass or other non-magnetic metal.

The revolving armature H^4, which is of the gramme-ring type, is mounted on a crank shaft I, revolving freely in bearings in spiders h' h^2, bolted to the front and back of the pole pieces G^2 G^3. These spiders thus serve not only as cross braces for the pole pieces, but afford a firm bearing for each end of the crank or armature shaft. This shaft projects both back and front beyond the face of the spiders, and is provided with cranks i i at each end. The pole pieces of the field magnets, as well as the armature, it will be observed, are flattened, so as to bring the cranks as close together as practicable, as this construction promotes stability of movement.

The commutator brushes are mounted upon insulated posts h^3, carried by one of the spider frames and projecting inwardly into the face of the armature ring, the commutator being located in this instance on the armature shaft within the face of the armature ring. The spokes or frame of the armature are arranged to one side of the vertical center of the wheel, so as to afford a chamber or recess for the commutator ring and brushes. This structure is compact, and enables the use of a very short crank or armature shaft, and locating the commutator wheel and brushes between the cranks. Connecting rods J, pivoted at one end to the cranks on the armature shaft, are connected at the other with a crosshead J', which carries the drill stock and slides vertically in or on guides j on the lower crosspiece, F'.

The drill K is mounted in the drill stock K', which reciprocates in a guide F^3, bolted to the under side of the crosspiece F'. It is essential to efficient work that the drill should not only be capable of reciprocating freely, but of rotating axially in its support. This latter movement is obtained in the following manner: The drill stock revolves and reciprocates in a socket, L, turning loosely in its support in the crosspiece F'. This socket carries a collar L', provided with a ratchet, with which a pawl, l, pivoted on the crosspiece F' engages. A screw, l', on the collar projects into an inclined groove, g^2, on the drill stock. On the upward stroke of the stock the pawl holds the ratchet, and the stock is thus partly turned in the socket. On the downward stroke the pawl slips on the rachet and the stock is not turned.

The organization above described would give the ordinary reciprocating crank movement to the drill; but as it is advantageous to prevent shocks and jars to the mechanism and to impart a darting or thrusting stroke to the drill, a spring M M' is mounted on each side of the crosshead. Spiral springs surrounding the stock above and below the crosshead are shown; the construction will be plain. Owing to this organization, on the upstroke of the crank the drill is cushioned by the compression of the upper spring M, while it is lifted to some extent by the expansion of the lower spring M'. On the downstroke these conditions are reversed, the lower spring being compressed and the upper spring being expanded, thus giving a thrusting stroke. The end play of the drill stock in its bearings thus obtained acts as a cushion to prevent communication of shocks and jars to the frame or motor.

The drill and motor can readily be adjusted on the frame by the telescoping screw, guides, or eyes n attached to the pole pieces for that purpose, traversing on the connecting bars which unite the yokes of the frame.

The electrical connections are arranged in the following manner: The bobbins of the field magnets are connected in series, the circuit wire w from the generator passing from the upper bobbin H, to the corresponding one, H', then to the lower bobbin, H^3, through the commutator and armature coils to the lower bobbin, H^2, and then back to the generator, the direction of the current being indicated by the arrows in Fig. 1. A switch S, of well-known construction, serves to cut off the current when desired.

The frame within which the motor and drill stock are mounted and fed surrounds and projects beyond the planes of the outer faces of the motor, so that all the parts of the motor, the cranks, and the connecting rods are in a measure protected against accidental injury by the overturning of the drill, or otherwise.

When the machine is folded for shipment or storage, the legs are telescoped and the upper legs turned up alongside of the motor. When thus folded, the legs serve as a further protection to the motor.

It will be observed that the motor is carried and adjusted in the longitudinal central axis of the supporting frame, that the drill stock is arranged in the same line, and that the power, being taken from both ends of the armature shaft, is also symmetrically applied around the same center. This organization prevents any lateral jarring or wabbling of the machine and gives a well-balanced and steady action of the drill, which is one of the chief results sought to be effected by the general form adopted for the machine.

Where the Electric Light was a Failure.

"That was a miserable light on the steamer Pilgrim, last night," remarked a Boston visitor to a New York Edison man. "It failed at a very critical moment."

"I don't understand how that could be. We have everything duplicated, and it is impossible for the light to go out," earnestly protested the electric man.

"Nevertheless, the light was very unsatisfactory. I tried to see four queens in my hand, and the electric light was so poor I only saw three. A tallow dip could have done that well."

Light and Ventilation.

At the Bijou Theater, Boston, the managers have, with characteristic enterprise, put into their house patent ventilators, which make the theater the coolest in this country. The Bijou was the first theater to use the incandescent light, and it is also the first place in which this new individual ventilator has been tried. Forty-five seats were fitted with the ventilators last week, and the result was that in a few moments, with the theater filled with people, and on a very warm day, the temperature of the house was reduced to 60°, and kept at that mark. The invention is controlled by the American Ventilating Company, of Boston, and is neat and simple in operation. A large zinc pipe is run from the orchestra floor of the theater into the open air. At a certain part of the pipe, which is located in a small room under the right balcony stairway, is inserted an iron fan which makes 1800 revolutions per minute, forcing fresh air, moving at a very fair rate of speed, into a large main which runs under the orchestra seats. The power used in moving the fan is supplied by an electric motor, which occupies but little space and gives out no heat. From the main under the orchestra seats little adjustable nickel-plated tubes run up the back of the chairs, and through these the cool air is forced into the house. At the top of each of these tubes is a clever arrangement for regulating the amount and direction of the current of air. It is possible, by using a great deal of electric force, to make the theater so cold as to be uncomfortable. The use of this invention practically puts the manager of the theater in complete control of the atmosphere in his house, and the greatest objection against summer entertainments indoors can no longer be urged against the Bijou. Not only is the temperature kept down to a comfortable degree, but the air is changed all over the theater every ten minutes, so that the atmosphere of the theater is pure and healthy. Managers Keith & Batcheller deserve great credit for their enterprise and liberality in introducing this new feature, and when their patrons realize the fact that the theater is really cool and comfortable, even on the warmest night, the managers will reap the reward of their efforts. The possibilities of this invention are very great, and it is likely that before long many public places, theaters, hotels, lunching rooms, offices, etc., will be supplied with these tubes, and cold air can be turned on in summer and hot air in winter, just as gas and the electric light are now controlled by simple stops.

Electro-Magnetic Induction and its Propagation.

By Oliver Heaviside.

Although the speed of the current is not quite so fast as the square of the length of the line, yet, on the other hand, it is not quite so slow as the inverse square of the length, as a writer in a contemporary (*Electrical Review*, London, June 17, 1887, p. 569) assures us has been proved by recent researches. However, if we strike a sort of mean, not an arithmethic mean, nor yet a harmonic mean, but what we may call a scienticulistic mean (whatever that may mean, and make the speed of the current altogether independent of the length of the line, we shall probably come as near to the truth as the present state of electro-magnetic science will allow us to go. But, apart from this, there is some *a priori* evidence to be submitted. Is it possible to conceive that the current) when it first sets out to go, say, to Edinburgh, knows where it is going, how long a journey it has to make, and where it has to stop, so that it can adjust its speed (scienticulistic speed) accordingly? Of course not; it is infinitely more probable that the current has no choice at all in the matter, that it goes just as fast as the laws of nature, preordained from time immemorial, will let it; and if the circuit be so constructed that the conditions prevailing are constant, there is every reason to expect that the speed will be constant, whether the line be long or short. Q. E. D.

Now, a great and striking thing about the non-distortional system, whose elementary properties were discussed in the last section, is the distinct manner in which it brings the speed of the current into full view. Another and very important thing is this: When the leakage is not so adjusted as to remove the distortion altogether, solutions become difficult of interpretation, owing to the almost necessary employment of Fourier or other transcendental series to express results. But by a proper adjustment of the leakage so as to abolish the tailing, which is the cause of the mathematical difficulties, we are enabled to follow with ease the whole course of events, say, in the setting up of the final state, due to a steady impressed force, without laborious calculations. And, although the state of things supposed to exist in the non-distortional system is rather an ideal one, yet it allows us to obtain a very fair idea of what happens when there is distortion, *e. g.*, in the oscillatory establishment of the steady state in a well-insulated circuit.

When we speak of a charge traveling along a wire at speed v, it should be always remembered what this implies. There are two conductors, parallel to one another, and the positive charge on the one is accompanied by its complementary negative charge on the other (corrections due to parallel wires, etc., are ignored here). The two charges move together. More comprehensively, the whole electro-magnetic field, of which the charges are a feature only, is moving along at speed v in the space between the wires, into which it also penetrates to a greater or less extent. In the non-distortional system this penetration is assumed to be perfect and instantaneous, so that the resistance and the inductance are strictly constants; and by the ratio R/L being made equal to K/S we make any isolated disturbance travel on without spreading out behind. In traveling it attenuates by loss of energy in the conductors and by leakage in such a way that if it attenuate from 1,000 to 900 in the first 50 kilometers, it will attenuate to 810 in the second, to 729 in the third, and so on; multiplying by 9/10 in every 50 kilometers.

In the last section was considered the uniquely simple case of a short-circuit at A, the beginning of the circuit, where any impressed force is placed, sending any shaped waves into the circuit, traveling undistorted, with uniform attenuation, and completely absorbed on arrival at the distant end B, by a terminal resistance of amount Lv. Of course this complete absorption at B of all waves arriving there is independent of the nature of the terminal arrangements at A. But these will materially influence the magnitude of the waves leaving A. Keeping at present entirely to simple cases, if we insert a resistance Lv at A, we can make a safe guess that the current will be just halved, because when there is a short circuit there, the line itself behaves just as if it were a resistance Lv. That is, the current at A is then e/Lv, however e may vary, provided there be a resistance Lv at B; or, which is equivalent, the circuit be continued indefinitely, beyond B, unchanged in its properties. This guess may be easily justified. That the current is zero when we insulate, or insert an infinite resistance at A, is also evident. In general, the insertion of a resistance R_0 at A causes the potential difference V_0 there, due to an impressed force e, to be

$$V_0 = eLv\,(R_0+Lv)^{-1} \quad . \quad . \quad . \quad . \quad (15a)$$

and the current to match to be V_0/Lv. The transmission to the distant end, and the attenuation, are as before.

But if the place of e be shifted along the circuit from A, interferences will result whenever the resistance at A has not the value Lv. Imagine e to be at distance x_1 from A. When put on, the result is to send a positive wave $\frac{1}{2}e$ to the right, and a negative wave $-\frac{1}{2}e$ to the left, both traveling at speed v, and attenuating similarly. Thus the circuit behaves towards e as a resistance $2Lv$, half to the right, half to the left. Now, when the negative wave arrives at A, if there be a resistance Lv there to absorb it, there will be no interference with the positive wave, which will go on to B and be absorbed there. The current at B will therefore be

$$C_B\,B = \tfrac{1}{2}\,(e/Lv)\,\epsilon^{-R(l-x_1)/Lv} \quad . \quad . \quad . \quad (16d)$$

the value of e to be taken at a given moment being that at x_1 at the time $(l-x_1)/v$ earlier. But if there be a resistance at A of any other amount than Lv, there will be a reflected wave from A, which will run after the original positive wave, and so make every signal at B have a double or familiar following it after an interval of time $2x_1/v$, which is that required to go from x_1 to A, and back again. Now the closer the seat of e is shifted towards A, the more closely will the familiar follow the original positive wave; and when e is at A itself, they will be coincident in front. Now, the current at A corresponding to (16*d*) is

$$C_A = \tfrac{1}{2}\,(e/Lv)\,\epsilon^{-Rx_1/Lv}; \quad . \quad . \quad . \quad (17d)$$

and (as will be explained in the section on Reflections) the reflected wave is got by multiplying by ρ_0, where

$$\rho_0 = (R_0 - Lv)\,(R_0 + Lv)^{-1} \quad . \quad . \quad (18d)$$

Now make $x_1 = 0$ and we shall verify (15*d*), and, by the union of the positive and reflected also positive wave, show that V at x at time t due to $e = f(t)$, any function of t, at A is

$$V = f(t - x/v) \times Lv\,(R_0 + Lv)^{-1} \times \epsilon^{-Rx/Lv} \quad (19d)$$

and the current there is V/Lv.

The most simple case after these of complete absorption at B, with complete absorption, or short-circuit, or any resistance at A, is perhaps that in which we short-circuit at both A and B. If a charge be then moving towards B it is wholly reflected with reversal of electrification. We must have $V = 0$ at B, and this requires every disturbance arising at B to be at once reversed and sent back again. The same thing happens at the short-circuit at A. Perhaps, however, the easiest way to follow events is to imagine the two charges, positive and negative, which always travel together, to pass through one another when they come to the short-circuit, so as to exchange wires. Thus one charge goes round and round the circuit one way, whilst the other, just opposite, goes round and round the other way. There is the usual attenuation. On this view of the matter, we may imagine the effect of a terminal resistance Lv to be simply to bring the charges to rest against friction. It need scarcely be said, however, that the day has gone by for any such fanciful explanation to be taken seriously.

Since the current in a negative wave (from B to A) is of the opposite sign to the electrification, there is no reversal of current by

reflection at a short-circuit. As, therefore, the reflected wave is to be superimposed upon the incident wave, we see that the current is doubled at B from what it would be were the circuit to be continued beyond B, or the critical resistance $L\sigma$ were inserted in place of the continuation.

The process of setting up the permanent state due to a steady e at A is now this: First the positive wave

$$V_1 = e.\varepsilon^{-Rx/Lv} \quad . \quad . \quad . \quad . \quad . \quad . \quad (20d)$$

if $x < vt$, which would be the complete solution were there no reflection at B. Now B is reached by V_1 in the time l/v, and the value of V_1 at B just on arrival is $e\rho$, if $\rho = \varepsilon^{Rl/Lv}$, which is the attenuation in the circuit. The reflected wave V_2 now begins. This is

$$V_2 = -e\rho^2.\varepsilon^{Rx/Lv} \quad . \quad . \quad . \quad . \quad (21d)$$

which travels towards A at speed v. In the meantime, the first wave V_1 is still going on, for the battery at A does not know what is going on at B. Thus, from $t = l/v$ to $t = 2l/v$ the state of the circuit is given by the sum of V_1 and V_2 so far as V_2 has reached, and by V_1 alone in the rest. On arrival of V_2 at A it is attenuated to $-e\rho^2$, and reflection then produces a positive wave

$$V_3 = e\rho^2\varepsilon^{-Rx/Lv}, \quad . \quad . \quad . \quad (22d)$$

which is a copy of V_1, only smaller to the extent produced by the multiplication by ρ^2. This wave reaches B when $t = 3l/v$, and then there commences the reflected wave, V_4, given by

$$V_4 = -e\rho^4.\varepsilon^{Rx/Lv}, \quad . \quad (23d)$$

going from B to A. This is a copy of V_2. And so on. Thus we have an infinite series of reflected waves, coming into existence one after the other; the state at any moment is expressed by the sum of the waves already existent; the final state is the sum of them all. Since the sizes of the positive waves form a geometrical series, and also those of the negative waves, they are easily summed.

The positive waves V_1, V_3, etc., come to

$$e(1-\rho^2)^{-1}\varepsilon^{-Rx/Lv}, \quad . \quad . \quad (24d)$$

and the negative come to

$$-e\rho^2(1-\rho^2)^{-1}\varepsilon^{Rx/Lv}; \quad . \quad (25d)$$

so that the sum of (24d) and (25d) expresses the final V of the circuit. And, since the current is got by dividing by $L\sigma$ in a positive wave and by $-L\sigma$ in a negative, the final current is the excess of (24d) over (25d) divided by $L\sigma$. Notice that whilst it is a process of settling down to the final state of electrification, it is a process of rising up to the final state of current. More strictly, whilst the potential difference at any spot oscillates about its final value, being alternately above and below it, the excursions getting smaller and smaller as time goes on, the current increments are all positive, though they get smaller and smaller. Now if the time l/v of a journey be exceedingly small, so that there may be thousands of journeys performed in getting up to say 99 per cent. of the final current, the current will appear to rise continuously, and the potential difference to have its final value from the first moment, which is in reality its mean value during the oscillatory period. This is the explanation I have before given of how it comes about that there is no sign of oscillation in any purely electro-magnetic formulæ, such as are universally employed when such short circuits are in question that the current seems to have the same strength (when no leakage) everywhere. It is really rising by little jumps, and differently timed at different places, but the jumps are too small to be perceived, and too rapidly executed. And the electrification is really (unless the vibrations are specially checked) vibrating about its mean value at any spot, which is its final value, though this mean value is assumed (in electro-magnetic formulæ) to be the actual value. But if the resistance in circuit be great, so that the final current is small, we have an oscillatory settling down of the current instead of a rise.

The solution (24d), (25d) is what we may at once get by considering the differential equation of the steady state and its solution to satisfy the terminal conditions. But our solution gives us the whole history of the establishment of this final state, and allows us to readily follow the oscillatory phenomenon into minute detail. When there is distortion there is difference in detail, which is then difficult to follow; but there is no substantial difference in the general results. We cannot make or break a circuit without a similar action in general. But we cannot expect to be able to simply formularize the results when the circuit is of an irregular type, *e.g.*, a laboratory circuit.

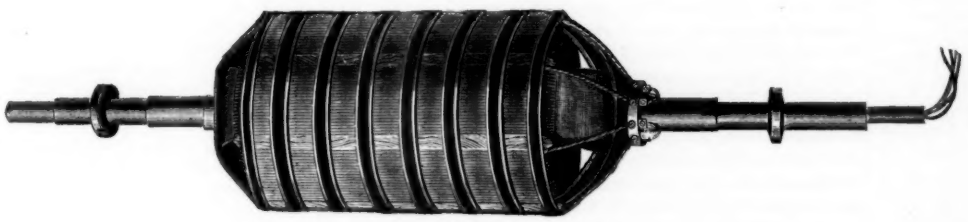


FIG. 2.—VENTILATED ARMATURE.

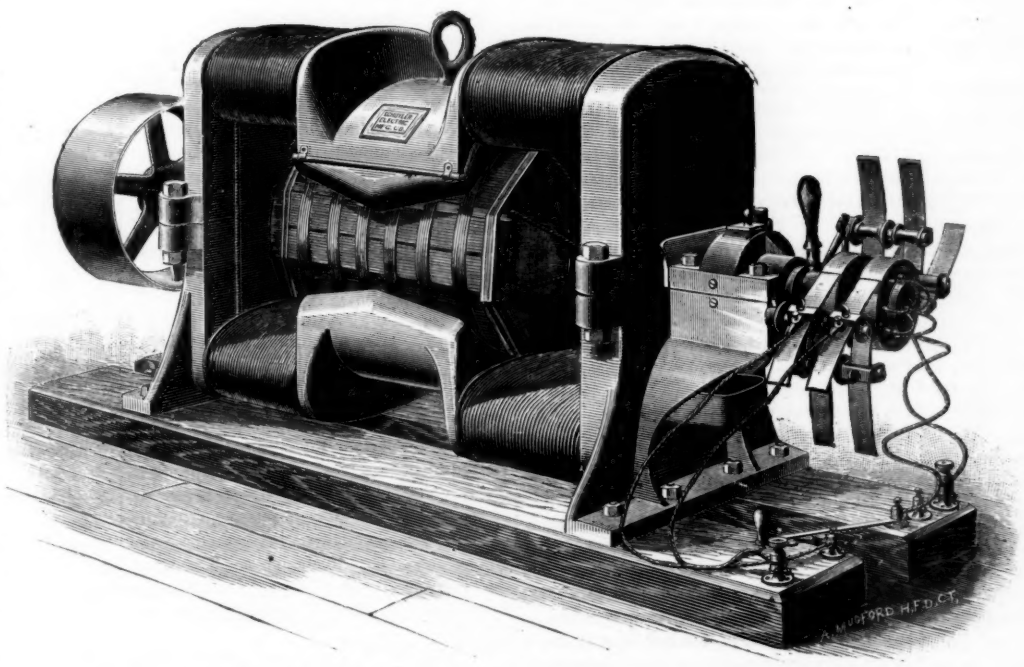


FIG. 1.—NEW DYNAMO WITH VENTILATED ARMATURE OF SCHUYLER ELECTRIC MANUFACTURING CO.

Conformity to Type in Dynamo Construction.

All interested in the evolution of electric machinery must have observed the continual effort made to produce something new in the way of dynamo structure design. The object of such efforts has been of a twofold nature, some designers seeking true improvement, either mechanical or electrical, or both, whilst but too many have sought in novelty of design alone to place a "new dynamo" before the public. Let us consider the case of the series-wound or arc dynamo, and we shall see that, all effort notwithstanding, the two original types—the armatures of drum and ring form—are in the main unchanged, showing, as we think, conclusively, that in this form of machine improvement must be sought in proportion and in detail, rather than in any attempt at departure, for type. Up to the present time, the designers of the above mentioned armatures have each held their ground, and consequently each has attained that survival which we are taught is the reward of the fittest. It must, however, be conceded that in one particular—viz.: in extent of radiating surface—the drum has the advantage; but this advantage is attained at the cost of superimposed coils, with their attendant possibility to short circuit across the points of highest potential, where the wires cross each other at the drum heads. The Schuyler Electric Manufacturing Company, who have always been noted as the successful makers of high tension armatures of this construction, claim to have completely overcome this danger, by the simple expedient of interposing an air space between each coil at the drum-head crossing points. An incidental advantage—and by no means a small one—attending this arrangement is the increase in effective radiating surface, and the fan-like action of the coils.

The illustrations herewith show the armature and dynamo complete.

The most serious danger in connection with dynamo machines is in the liability, under certain conditions, to burn out an armature. In the case of the Schuyler ventilated armature, this is claimed to be impossible. Indeed, we are assured by the company that they will warrant their armatures in every case; and during the last year they have not had a single instance of a burn-out. This feature is one which can be fully appreciated by the users of electrical apparatus.

The Sanitary Influences of Trees.

Our esteemed contemporary, the *English World of Science*, says: "A few years ago a dispute was carried on rather hotly amongst some Continental medical men as to the sanitary influences of trees, and although ible lungs or having any tendency to rheumatism need to be carefully guarded against such influences. Where the foliage is dense about houses, or where the limbs overshadow the piazzas or roof, they become the storage places for damp, unwholesome air. The falling leaves gathering from year to year give a corresponding dampness to the soil, while at time of foliage the sunshine is measurably excluded. It is pretty evident that mankind was not intended to be reared in the woods. The influence of trees in causing malaria, or in so intercepting it as to have it tarry among them, has long been known. 'A dry garden on gravel, of three acres in extent, in Surrey, surrounded by trees, is generally three or six degrees colder than the open common beyond the trees; and a large pond in a pine wood twenty miles from London afforded skating for ninety consecutive days in the winter of 1885-6, while during the greater part of the time the lakes in the London parks were free from ice.'

"We know with what interest the lover of trees watches the growth of those planted by his own hand, and how many are apt to be scattered about the new home mansion. As years go on, and their growth and foliage increase, the owner is loth to remove them, or severely to shorten their branches. If so, there is great danger that the dry soil and once comfortable home will come to be the dampest and least desirable spot in the neighborhood. A recent careful writer has given the following sensible direction as to tree planting, as it bears upon the conditions of health: 'A tree should not stand so near a house that if it were to fall it would fall upon the house; or, in other words, the trunk should be as far from the house as the height of the tree. Belts of trees may be planted on the north and east aspects of houses; but on the east side the trees should not be so near nor so high as to keep the morning sun from the bed-room windows in the shorter days of the year. On the south and west aspects of houses, isolated trees only should be permitted, so that there may be free access of the sunshine, and of the west winds, to the house and grounds. High walls and palings on these aspects are also objectionable, and should be replaced by fences, or, better still, by open palings, especially if the houses are occupied during the fall of the leaf and in the winter. Trees for planting should be chosen in the following order: Conifers, birch, acacia, beech, oak, elm, lime, and poplar. For our American homes we must add the maple, the ash, and the tulip tree, or American poplar, although the dense foliage of the maple is sometimes objectionable. Pine trees collect the greatest amount of rainfall, and permit the freest evaporation from the ground, while their branchless stems offer the least degree of resistance to the lateral circulation of the air. Acacias, oaks and birches are late to burst into leaf, and therefore allow the ground to be warmed by the sun's rays in the early spring. The elm, lime and chestnut are the least desirable kind of trees to plant near houses. They come into leaf early, and cast their leaves early, so that they exclude the spring sun, and do not afford much shade in the hot autumn months, when it is often required. Trees are of value in indicating choice of residence. Rich foliage, ferns and mosses tell of dampness and alluvial deposits. Flowers and fruiting trees point to a dry and sunny site. Children will be healthiest where most flowers grow, and old people will live longest where our common fruits ripen best.'"

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When you have the earth, why grab for the moon? Respectfully referred to the carbon combiner.

At a regular meeting of the Board of Trustees of the Electrical Accumulator Company, held July 7, Mr. H. R. Parrish was elected secretary and treasurer, in place of Mr. C. R. Truex, who resigned to accept the position of assistant general manager of the same company.

A gentleman interested in inventions wishing to have an expert's opinion of a certain undeveloped device, sent an electrician in the employ of his company to examine and report. Being a member of the syndicate formed for the purpose of perfecting the invention in question, he sends to the treasurer a bill for the services his electrician had rendered to himself. It is hinted that the old proverb, "You can't eat your cake and have it too," is to be reinsulated.

The great carbon combination seems to have irretrievably collapsed. The list of mourners is not large.

Alternating systems seem to be the fashion just now with the electric light companies. Every parent company will soon have its own.

Considerable interest has been felt in the report of the principal examiner in the department of electricity in the Patent Office at Washington, on Prof. Elisha Gray's petition to amend a claim in his application for a speaking telephone patent by inserting the word metallic before the word diaphragm in the original. The argument was heard May 24, 1887. Mr. Brown decides adversely to the amending of the claim.

The railway telegraph superintendents held a very successful meeting in Boston, last week, and adjourned to meet in New York next year. This organization is composed of able, energetic men—officials holding most responsible and exacting positions, and we are glad to see the majority of them believe in progress in matters electrical. The REVIEW office was honored with very welcome calls from the superintendents.

It is now a common occurrence in England for parties, balls, receptions, banquets, etc., to be lighted by electricity. In most cases the installation is temporary, the current being supplied by secondary batteries brought to the place fully charged. That the price paid for this service is remunerative is shown by the fact that several corporations have recently taken up this work. The great distances in this country are a serious obstacle in the way of temporary installations.

There is a large amount of telephone stock floating around which is not of the Bell variety. There are parties to-day who believe that the time is not far distant when the Bell patents will be either so hedged in as to be virtually public property, or that the telephone patents will be thrown into the public domain, and the race become free for all, regardless of age, sex, or previous condition; and a year or so ago it was an often reiterated statement that a move was on foot at Washington to "settle the hash of the hated monopoly forever." If this is to be the fate of that hash, there must be certainly several back counties to hear from. So "*Nous verrons*," which is A. D. T. French for "Wait for the verdict."

Mr Dawson, of water gas fame, has shown that steam engines, coal costing $2.50 per ton, develop power more cheaply than gas engines using coal gas at 75 cents per 1,000 cubic feet. When the Dowson process is used, gas is produced for less than 10 cents per 1,000 cubic feet, and with this power can be obtained more cheaply from gas than from steam engines. There is a desire in this country to use gas engines for electric lighting purposes. In only one city (Lynn, Mass.) is manufactured gas sold for a price less than 75 cents, and the price charged, 30 cents to large consumers, is no lower than a rate of 75 cents for coal gas, as this has much greater heating power. At the present prices for gas it would seem that gas engines cannot successfully compete with steam plants for electric lighting on an extensive scale.

It is an honor to be imitated. That a process or product is copied is good proof of excellence. The numbers who are unloading upon the public the stock of companies with an impossible or to-be-developed system, testify to this statement. Legitimate electrical enterprises perhaps pay the best of any at the present day. Before purchasing a piece of real estate, competent attorneys are employed to examine the title. Much more reason is there for a capitalist to consult an electrical expert before investing in a new enterprise. There are numerous primary batteries in a more or less developed state; some possess merit, others are frauds. The great possibilities of an improved battery are so patent to every one, that a victim invests without informing himself of the merit of the device.

THE INFANT RAPIDLY BECOMING A GIANT.

The public expect much of improvements in which electricity is employed. Millions may be spent in digging a canal where the channel fills up from a slow movement of the soil as fast as it is removed by the dredging machines; failure after failure may be recorded in the annals of mining developments until success seems to be the exception, but let there be a failure of an electrical piece of mechanism and every one wonders. In the early days of the development of the systems of electric lighting, storage, and transmission of power, there were few failures, and those were instructive. The first devices for automatically lighting and extinguishing gas were somewhat crude. Now, however, with careful installation, failure is unknown; yet ten years ago the great systems of lighting by electricity had only been dreamed of. It required thirty years to perfect the system of telegraphy. The methods used in gas making were not improved for a long period. And it is possible that the old process would have been in use for half a century longer if the competition of electric lighting had not necessitated improvements. So much has been accomplished that still more is expected of our electricians. The inventor or experimenter was once called a crank. Now large sums of money are expended yearly in systematic experimenting, the highest skill, education and ability is employed, and the professors in the universities and technical schools are retained as consulting electricians.

BOOK REVIEW.

Abstract of the Proceedings of the Society of Arts, with List of Officers and Members, for the Twenty-fifth Year, 1886-1887. Boston.

Among the papers the following were on subjects pertaining to electricity:

Incandescent Lighting from Arc Light Circuits, Mr. Frank Ridlon.

The New Art of Electric Welding, Prof. Elihu Thompson.

The Martin-Wilson Automatic Fire Alarm, Mr. A. H. Kendall and Mr. M. Martin.

Electrical Distribution by the Aid of Induction Coils, Mr. M. M. M. Slattery.

List of Experiments in Physical Measurement. Harold Whiting, Instructor in Physics, Harvard University, Cambridge, 1887. Published by the University.

This pamphlet is intended for the use of students preparing for admission in advanced physics. It is now no longer necessary for a student to study Greek before entering college, provided a sufficient amount of modern languages, mathematics and science, is offered in its place. The introduction gives suggestions for the taking of notes and the plan of instruction recommended.

In addition to the sixty experiments, twenty-six alternatives are given, which may be substituted as desired for any of the original set. The appendix contains suggestions concerning the cost of apparatus, and the time required to complete the course. A convenient list of apparatus follows, with prices at which they can be purchased or made. It was not intended in this pamphlet to describe the experiments fully. For this, references are made to the standard laboratory manuals, including the author's Syllabus of a Hundred Physical Measurements. Dr. Whiting has done careful and valuable work in preparing this course.

"Electricity treated Experimentally. For the use of Schools and Students." Linnæus Cumming, M.A., Assistant Master in Rugby School. D. Van Nostrand, New York, pp. 389.

The author is well known to the scientific public through his Introduction to the Theory of Electricity. The work in question is the substance of experimental lectures delivered to the senior class at Rugby. The more difficult paragraphs, many of which are mathematical, are starred, and may be omitted in the first reading. The illustrations, of which there are 242, are, with few exceptions, entirely new, being drawn from apparatus actually in use by the author. While they are excellent from an artistic point of view, they are free from ornament and are clear and instructive. The subject of measurements is interestingly treated and electro-dynamics are explained with greater fullness than is usual. Questions and problems are given on each chapter.

OUR CHICAGO LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

Mr. F. W. Horne, formerly manager of the Excelsior system here, has latterly returned from the South after three years' absence. Mr. Horne has again dropped into the chair vacated by him, and has had the seat widened somewhat to take in all the Western and Southern States. His first appearance was made known to several competitors for the lighting of the cable road stations, three in number, having a total of forty-five lights. Horne now will do the work.

The Chicago Arc Light and Power Company's general officers are moving into their new quarters, and are putting on an immense amount of style in shirt sleeves and limp cravats. The fact is, to have the thermometer ranging between 90° and 100° for ten days in succession, and a red-headed clerk running the weather bureau at Washington in the absence of the proprietor, would make any one put on airs if he could only find a fan. The gentleman from Berlin who was said to have inquired at the bureau one cold day last winter if:

"Comes pretty soon in de man owns de business?" or some other man should look to it, and see if this Mississippi and Texas weather cannot be sent where it belongs and our summer resort apportionment be given to us who are not acclimated to tropical weather—to these Nellie Blazes sort of days. We make it up nights, however, so we can stand it, but "we hain't been usen for to do so."

The Chicago Club held a meeting in its new quarters on the 11th instant, with a remarkably good attendance, considering the unusual heat. Mr. C. C. Haskins read a brief paper on the electric lighting of water craft, apropos of the loss of the steamer Champlain, on Lake Michigan, in June. The discussion which followed was participated in by Messrs. Mailloux, of New York, Leonard, of Chicago, and others.

Subsequently a discussion of the dangers of electric light currents was entered into generally by the members, and a deal of personal experience was given. The whole culminated in a motion that Prof. F. B. Badt, of the U. S. Company, be requested to prepare a paper on "The Physical Effects of Electricity," to be read at the next meeting of the Club. Prof. Badt accepted the invitation, and will be very certain to provide an entertaining and instructive paper, his well-known ability rendering him abundantly able to do the subject justice.

Considerable space has been devoted in these columns to the local telephone question in Chicago.

At the last meeting of the council the following communication from the Corporation Council was read:

"In reply to your request I herewith submit my opinion as to the legality of the ordinance submitted relative to licensing telephones. The General Incorporation law authorizes the corporate authorities of the city to license certain trades and occupations. These trades and occupations are specifically enumerated. It does not include in the enumeration telephones. It may be for the reason that the telephone as a system was not in public use at the date of the passage of the act.

"This specific enumeration of the power implies the exclusion of all others, and therefore the Council has no right to impose a license on telephone companies.

"I am of the opinion that the license cannot be imposed under the exercise of the police power of the city. Under the exercise of the police power under legislative authority, unless such appears to have been the legislative intent, the law does not give the authority to the Council to use the license as a mode for collecting revenue.

"Believing that the power to license is inhibited by the fact that the occupation is not directly or impliedly enumerated in the General Incorporation law, and that it is not within the intent or boundaries of the police power, and that it does not come within the spirit or letter of the law authorizing the exercise of that power for the protection of the lives or health of the citizens, or the preservation of good order and public morals, I am of the opinion that the ordinance submitted is illegal."

Ald. Hamline introduced an ordinance relating to the taxing of telephones, the figure being fixed at $10 per annum. The ordinance gets around the Corporation Counsel's opinion by making it a condition precedent to the granting of any rights to telephone companies that said companies first file a statement with the City Collector showing the number of telephones in operation, and requiring the companies to get a permit from the Commissioner of Public Works for operating such telephones, the City Collector's receipt for $10 having to be produced at the time.

It is not certain that this new form of forced contribution is to be a success; but it is quite likely to be attempted, when a test case will probably be made, and the legal status of the enactment settled.

In the so-called boodler cases (conspiracy to defraud the county) there is great difficulty in getting the one dozen good men and true to judge the case. Everybody dodges who can; and those who are caught flutter, and escape, if possible. A special venire the other day caught Ed. Sholes, a well-known old-time operator. His plea for liberty was an astonisher to the court, and showed how completely the business of the company employing him would go to "everlasting ruin," if he were retained; but even the endorsement of the general superintendent, L D. Parker, added to all that Ed. had remarked on the sad occasion, failed to soften the obdurate heart of good Judge Jamieson, and induce him to remove the galling chains of jurorship. The general superintendent, the clerk and assistant to the general superintendent, and the company, which the same is the Postal Telegraph-Cable and the United Lines, all have the sincere sympathy of the electrical fraternity.

One of those curious affairs which M. Planté has done so much to investigate, called ball lightning, or spherical electricity, raised hob, and frightened people generally, in Detroit, on the 10th instant. The exhibit took place at 38 Hancock avenue, west. The meteor was first seen by a thirteen year old daughter of Mr. Patton, who says she opened the room door just in time to see the ball of fire, as "large as a cocoanut," burst through the wall paper in front of the chimney, and sail round the room gracefully, like a toy ballon, hissing as it went. Flakes of soot filled the air; and Mrs. Patton, who saw the phenomenon almost as soon as her daughter, fully corroborated the statements.

Mrs. Frisbee, a neighbor, entered the house soon after the uncomfortable visitor was first discovered, and the draft of air presumably gave the ball a motion toward and out of the door, where it disappeared, singeing her hair as it went.

The strange visitor came through the stovepipe hole in the chimney, and evidently came down that way from the atmosphere above. A portion of the chimney was injured, and some of the roof shingles were ripped up and demolished. Those who saw it say that the flame was of a greenish red, and that it left behind an "odor like that from burning sulphur," which, of course, means ozone. The whole neighborhood was pretty thoroughly frightened.

This skirmishing of lightning freaks has been part of the summer programme this year. Down at Mount Pleasant, near Nashville, Tenn., on the 12th, a lot of colored people had been attending a funeral, from which they were driven by an approaching storm, and took refuge from the rain under an oak. Lightning struck the tree, and four ministers and five other persons were instantly killed.

The Police Telephone and Signal Company, of Chicago, complain of a press of business. Within the past few weeks Milwaukee has ordered an increase of 20 per cent. on her outfit; Omaha increases hers (which is quite recent), over one-third; Joliet has ordered six additional stations; Detroit, twelve, and Hyde Park the same.

The Edison Company has commenced work under its city franchise, and is laying its underground conductors on Washington, between Clark and Dearborn.

CHICAGO, July 18, 1887.

OUR BOSTON LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

July 19 and 20 Jefferson Physical Laboratory of Harvard College will be open, and specimens of the apparatus necessary for the elementary laboratory work in physics for admission will be shown and explained. On the second day the apparatus for the advanced admission physics will be shown.

The Electric Gas Lighting Company are putting on the market an iron hub box bell of novel design. This is brought out in conjunction with the celebrated Victor Wood box bell. The working parts are concealed in and protected by the iron hub, which serves also as a support for the bell post. The magnet is of horseshoe form. The armature is pivoted on a pin attached to the box base and is held in position by a lock spring attachment, by means of which the adjustment of tension of the spring, as also the position, is secured. The contact may be changed from the outside without disturbing the position of the bell.

The Boston Electric Light Company started a 600 light Sun dynamo at the Stanhope street station last week. The 300 light machine was then brought to this station from the Ferdinand street station, where it had been in operation. An additional 600 light machine will be installed in a few weeks. These are dynamos used by the Sun Electric Company, with their converter system, that is giving great satisfaction to both the Boston Electric Light Company and the users of the light. A large force of men is at work wiring, and at the time of the electric light convention between one and two thousand lights will be burning on converters.

A habitant of the Hub, of poetic name, became wroth because certain electric light wires were over his building and at last possessed himself of some monstrous shears and began to cut the lines, thinking nothing of the danger to persons in the streets and to neighboring buildings. As it happened, the wires were temporarily out of use, and the break was discovered in testing up the lines, and the wires removed to a neighboring building. The hero glories in the thought that he has made one point on a "lighting" company, and shows his shears to his friends and says "What a great boy am I."

Mr. E. H. Mulliken, who was recently discharged from the position of superintendent of the Cambridge Electric Light Company, has filed a bill in equity in the supreme court at East Cambridge, praying for a writ of mandamus to issue against the directors of the company, compelling them to reinstate him. A hearing will be held in the case on the first Monday in August.

The Point of Pines, the Coney Island of New England, is well patronized this season; the electric railroad carries crowds of passengers, and is an unfailing novelty. A novel attraction is in preparation, in which electric illumination will be employed. This resort was one of the first on the coast to appreciate the advantages of the arc light. The plant consists of three ten-light Weston machines of an early type, and the service is excellent.

The extension of the underground system of the New England Telegraph and Telephone Company is proceeding rapidly. The conduits have been laid in Hanover street, and in a few weeks the cables will be in working order as far as the Charlestown line.

The city fathers have the name of being behind their colleagues of other cities in the introduction of improvements. That is not because Boston is old fogyish. No. They wait until other places have experimented and spent their money. The hue and cry about overhead wires has never reached the hub. Now that New York and Brooklyn have obtained some practical results, a vacation committee of the city government has been visiting New York, Brooklyn, and Philadelphia, studying the underground wire problem.

BOSTON, July 19.

A Reply from Mr. Eickemeyer.

To the Editor of Electrical Review:

DEAR SIR: In answer to the question of "Armature," in your issue of July 16, it is only necessary to refer to the figure to show that the armature in question is not a gramme ring.

The device illustrated is an open circuit unipolar machine, in which the armature is a copper tube, the brushes being located as indicated by the dotted lines in the figure.

The magnetic current or lines of force are cut in one direction only during the rotation of the armature and the current produced flows from the dotted line on the contact ring on the shaft to the contact ring on the end of the copper tube near the helix.

As the current produced in this armature or tube flows in all its parts in one direction only a gramme ring is simply balanced.

Every wire in the coil outside of the iron ring core of the gramme ring produces a current which is exactly balanced by the return wire inside, and as there are necessarily as many wires inside as out there is no current produced on the brushes.

R. EICKEMEYER.

Yonkers, N. Y., July 15.

Primary Batteries.

Companies have been formed in the past to exploit some battery invention. Private houses, photographic dark rooms, and even railway cars have been successfuly lighted. But the expense of producing, by means at present known to the world, the light by the consumption of zinc, has been so much above the cost of gas that it was a prime luxury afforded by the few. All these enterprises have been abandoned as having no commercial practicability. The primary battery syndicates remind one of those meteoric displays which brighten the sky and drop out of existence.

A Half-Century of Telegraphy.

From our esteemed contemporary, the London *Electrician*, we extract the following interesting review of the progress of telegraphy: A few years back, when the craze for centennial celebrations was at its height, the suspicion arose that every great man must have flourished and every remarkable event must have occurred exactly one or more centuries ago. The promoters of these anniversaries experienced no difficulties in regard to dates. If the great man was not born in the particular year required, he obligingly died in that year, or he did something that constituted an epoch or a landmark at the quite correct moment. Anyway, the centenary was celebrated with becoming enthusiasm, if not always with rigid respect to dates. In the case of the jubilee which has just been—or, rather, is still being—celebrated throughout the length and breadth of the land, no such historic doubts have crept in; and similarly with regard to the proposed jubilee commemoration of the telegraph, foreshadowed in our last issue, the year and the day are as nearly coincident as the exigencies of public life will permit. The first electric telegraph of a really practical sort in this country was worked on the evening of July 25, 1837, and on Wednesday evening, July 27, 1887, its fiftieth birthday is to be appropriately celebrated. It was in the precincts of the metropolis—that is to say, between the Euston square and Camden Town stations—that the first electric telegram was flashed, and within a mile or two of that famous spot the living representatives of Wheatstone and Cooke will do honor to their memory, and proclaim with characteristic festivity the national pride in these fifty years' fruit of their labors.

In another column will be found the particulars of the proposed gathering, which it is understood will take the form of a banquet, where every Englishman of mark whose name is associated with the rise and progress of telegraphic enterprise we feel sure will be present. It will, we imagine, be an essentially English celebration; we do not mean exclusively so; that may be as it happens. But the occasion being one to mark the origin and rise of an English invention, the expansion of which has been largely, and in one branch of it wholly, due to British science, British capital, and British energy, the assembly ought to be British, and the demonstration a national one. Our claim to have invented the electric telegraph may be disputed both on the Continent of Europe and in America, but nobody has questioned the originality and utility of the system we propose to commemorate as our own, or denied the rapidity and vigor with which we have turned it to account in every corner of the world. It was in "a dingy little room, and by the light of a flaring dip candle" that the first words of the electric messenger over a distance of less than two miles were spelled out. Only fifty years have elapsed since that memorable night; and we see the whole world entwined in a network of myriads of miles of wire; and from the shabby little office in Euston square, the mind naturally turns to the gigantic proportions and splendid equipments of the English Central Telegraph Station to-day. From the Holborn Restaurant, where the banquet is to be held, and where the electric light—itself an outcome of electrical research—will illuminate the proceedings, every word that is spoken might be transmitted to the other side of the Atlantic in less time than it took those two famous amateurs to make their first essay in telegraphy. That "tumultuous sensation" which Wheatstone experienced on hearing the click of the needles may in some degree be shared by us to-day; and if it be true that he felt "all the magnitude of the invention then proved to be practicable beyond cavil or dispute," the realization of his wildest dreams has added fresh luster to his name by attesting his boldness and foresight.

We have said that the claims of England for priority in the invention of the telegraph may be disputed, and we have no need to assert them here. Prof. Morse, who was working on a different line to attain the same end as that of Wheatstone and Cooke in this country, has claimed and received the distinction in his own person for America. But it is on record that Morse publicly complained of "Wheatstone in England and Steinheil in Bavaria, who have their electric telegraphs, being afforded the means of bringing forward their methods, while to my invention of earlier date than theirs my country seems to show no favor." These words are at all events conclusive as regards the respective countries, whatever they may be as touching the individuals, whose relative merits are really never in question. What we as a country may fairly claim is that the first acceptance and application of electric telegraphy to practical uses was by England, just fifty years ago.

Mr. John J. Carty, formerly in charge of the Boston Telephone Exchange, will be associated with the cable department of the Western Electric Company, New York. Mr. Carty is a bright young electrician, an expert in cable matters, and will be a valuable addition to the staff of the Western Electric Company.

The Board of Managers of the Electric Club held a meeting Tuesday evening of this week and adopted a form for the bonds to be issued by the club, Messrs. Miles W. Goodyear, of the firm of E. S. Greeley & Company, and Henry D. Lyman, Vice-President and General Manager of the American Surety Company, being appointed trustees. Mr. J. N. Keller was added to the Board of Managers, and Lieut. F. W. Toppan, U. S. N., appointed member of the Committee on Membership to fill the vacancy caused by the death of Mr. Jackson Bailey. New members were elected, including Theo. N. Vail, Prof. Wm. A. Anthony, Paymaster W. C. McGowan, U. S. N., Wm. Bracken, J. E. Powell (of Washington), Chas. E. Chapin and Profs. Mead and Robb (of Hartford), Theo. E. Otis, W. W. Griscom, S. Roosevelt Schuyler, Frank R. Brady, S. F. Moriarty, Dr. H. A. Bunker, F. A. M. Burrell. J. G. Noyes, Hugh J. Toland and H. H. Eustis (of Boston), R. W. Blackwell and a number of others, numbering forty in all. Work on the new club house was reported going ahead rapidly, and the latter part of August will probably see the building ready for occupancy.

Telephonic News

*** The directors of the Bell Telephone Company met last week and declared an extra dividend of three per cent. President W. H. Forbes will resign and Howard Stockton will succeed him, but no action was taken at the meeting. Mr. Forbes will still remain a director and retain his large interest in the company, which he has done so much to build up.

*** The work of laying the terminal conduit for the underground telephone wires has commenced in John street, Buffalo, on which one side of the telephone building faces. The conduit is 6x8 feet, and into it all the wires will be run. It will be open to the Seneca street curb, and from there the wires will be run in creosoted wood conduits to the other points. It will take ten days to build this and the man-hole in Seneca street.

*** The Pittsburgh telephone lines, which have been idle for many weeks, on account of the fire, are in use again. The telephone exchange is rapidly being put in order. The new Smith switchboard has been placed in position, and 900 of the 1,340 lines are ready for service. Chief Operator Gray says that all the damage will have been repaired by July 20, and the office will be in shape to do better work than before the fire. Operations have been somewhat retarded by the repairs on the building.

*** A Washington special says that the Pan-Electric Telephone stock has been transferred to a new company, freezing out the Rogers, who have thereupon issued a warning against such a proceeding. The stock is said to have risen to $12 per share, and the Messrs. Rogers are seeking by legal proceedings to save themselves from being euchred out of a property which in the minds of some seems to be on the point of acquiring value.

*** The announcement is made that the American Telephone Company, which recently came to grief through the discovery that its chief manager was an ex-convict, will at once be revived. Gen. Butterworth, however, will no longer be president of the company. The explosion in the company over Tyrer's record injured Butterworth's reputation somewhat with those with whom he is unacquainted, and he will retire from the presidency as soon as the company is reorganized. It is claimed that all money has been refunded to stockholders.

*** The Chesapeake and Potomac Telephone Company at Washington has applied for an injunction to prevent the National Safe Deposit Company from constructing a vault which will interfere with cable wires laid by the telephone company at the northeast corner of Fifteenth street and New York avenue. The wires, it is stated, were laid under a permit granted in 1884, and it is claimed that this permit invalidates the permit obtained by the Safe Deposit Company for the building of the vault. The plaintiffs state that they are willing to run the wires over the crown of the arch to avoid trouble, but the Safe Deposit Company refuse to take any steps toward settling the affair.

*** George Addy, the enemy of the telephone company in Paterson, N. J., was made defendant in three criminal suits instituted against him. The first was by the general manager of the company, and charged Addy with malicious mischief in destroying property owned by the telephone company. Kiernan Brennan, a lineman of the telephone company, charged Addy with assault and endangering his life, in cutting a pole while the complainant was fixing wires on top of the pole. Alderman Miller, of the Committee on Fire Department of the Board of Aldermen, charged Addy with cutting the wires of the fire alarm telegraph, an offense punishable with fine and imprisonment. Addy owns a great deal of real estate, but has frequently been in trouble on account of his impetuous disposition. The telephone company will also institute a civil suit against him for damages.

Decided Against Prof. Elisha Gray.

Frank P. Brown, principal examiner in electricity in the Patent Office, has submitted to the Commissioner his report on the request of Prof. Elisha Gray for leave to amend the claim in his application for patent for the speaking telephone, by inserting the word "metallic" before the word "diaphragm" in his original claim. Argument was heard in the case May 24, 1887. Mr. Brown decides adversely to such amendment, holding that it is concluded by the decision in the original speaking telephone interference cases, and that its subject matter has been abandoned by Gray.

The Boston Investigators.

New York was visited last week by a number of the officials of Boston, sent out by that city to investigate the underground wire work of New York, Philadelphia, Washington, and other cities. The party was composed of Aldermen, McGuire, Carroll, and Sullivan; Councilmen, McNary, Gomez, and Tuttle; Assistant Clerk of Committees, J. P. Brawley; Col. Hugh J. Toland, Superintendent of lamps for the city of Boston; Mr. Fred. A. Gilbert, President of the Boston Electric Lighting Company, and Mr. Michael Meehan. The last three gentlemen accompanied the committee by request.

The underground work in New York and Brooklyn was inspected, and calls made on the underground commissioners and several of the electric lighting companies of the city. The Edison underground system was carefully inspected.

Several of the gentlemen were callers at the rooms of the Electric Club and were entained by the members. The committee apparently concluded before leaving the city that the question of underground wires is one that deserves very careful action, and is yet, particularly in relation to the burying of arc light wires, one full of uncertainties. The REVIEW is indebted to the visitors for a very pleasant call.

An Elephant Shocked.

One of the most interesting features in the magnificent pageant of victory, seen every evening at St. George as part of the spectacle called the "Fall of Babylon," with the 1,000 ladies and gentlemen comprising the procession, are the huge elephants and other ponderous beasts. The tallest and heaviest of the elephants is called Chief, and he belongs to one of the large circus combinations, to whom the management of the "Fall of Babylon" pay for the use of him and the other animals a large sum per week. Running all over the monster stage and vicinity are innumerable electric wires, which are used to convey the electric current to the 500 lights focused on to scenery to produce the marvelous effects. These wires are exceedingly dangerous to those unacquainted with their use, and signs are placed here and there cautioning the performers about the risk of coming in contact with the electrically charged wires. The caution is generally observed by them. Unfortunately, there are no signs that can be interpreted by the animals, and one evening the entire company was startled by a roar from the big elephant Chief that could have been heard at the Battery.

Chief, it seems, while awaiting his cue to take his place in the procession, amused himself by leisurely investigating surrounding objects. Before he could scent his peril, he had quietly insinuated his trunk between two of the heaviest wires used. The roar which followed was succeeded by others, each louder than the previous one, and more indicative of pain. The keepers rushed to the spot in time to see the ponderous animal keel over and fall to the ground, writhing in pain. Almost a panic ensued among the supers and coryphees, who imagined the elephant had become maddened, and was going to tear things up generally. Pails of water were thrown on the quivering trunk, while the poor beast tossed himself from side to side in pain. It was fifteen minutes before the poor beast could pull himself in form for taking his part. When examined by a scientific veterinarian the animal's trunk was found to be severely burned. Now there are signs adorning the place which read: "No animals permitted near the electric wires under any circumstances."

Railway Telegraph Superintendents.

THEIR SIXTH ANNUAL CONVENTION HELD IN BOSTON—AN IMPORTANT MEETING.

The Sixth Annual Convention of the Association of Railroad Telegraph Superintendents was held at the Tremont House in Boston on Wednesday and Thursday, the 13th and 14th inst.

The convention, which was a large one, was called to order at ten o'clock, Mr. A. R. Swift, of the Chicago, Rock Island and Pacific R. R., President of the Association, in the chair.

Among the members present were the following gentlemen: G. L. Lang, of the New York and New England R. R., Vice-President of the Association; P. W. Drew, of the Chicago and Eastern Illinois R. R., Secretary and Treasurer of the Association; W. K. Morley, of the C. & A. R. R.; J. B. Shaw, of the N. Y. P. & O. R. R.; C. B. Davidson, of the C., St. P., M. & O. R. R.; L. A. Boyd, of the I. D. & S. R. R.; M. Magiff, of the Central Vermont R. R.; E. E. Torrey, of the Michigan Central R. R.; S. S. Bogart, of the N. Y., W. S. & B. R. R.; L. T. Sheldon, of the Missouri Pacific R. R.; G. C. Kinsman, of the Wabash R. R.; G. T. Williams, of the N. Y., C. & St. L. R. R.; J. H. Hill, of the Southern Kansas R. R.; C. C. Reynolds, of the I. & St. L. R.R.; S. K. Blair, of the N. Y., C. & St. L. R. R.; C. E. Hilton, of the Norwich and Worcester R. R.; J. N. Ross, of the N. Y. & N. E. R. R.; J. W. Lattig, of the L. V. R. R.; N. E. Smith, of the N. Y., N. H. & H. R. R.; T. J. Higgins, of the C. C. C. & I. R. R.; G. E. Simpson, of the C. M. & St. P. R. R.; Chas. Selden, of the B. & O. R. R.; M. B. Leonard, of the N. N. & M. V. R R.; J. Cohen, of the H. & T. C. R. R.; C. A. Dartlow, of the R. & D. R. R.; W. J. Holmes, of the N. Y., L. E. & W. R. R.; C. E. Topping, of the Long Island R. R.; H. C. Robinson, of the B. & L. R. R; C. M. Chevalier, of the N. Y. & N. E. R. R.; C. S. Dastleton, of the R. & D. R. R.; F. H. Benjamin, of the N. & W. R. R.; H. N. Rowell, of the B. & M. R. R., and S. K. Blair, of the N. Y. C. R. R.

The reading of the report of the Secretary and Treasurer showed that the Association was in a prosperous condition, and out of debt

The chief work of the forenoon was the discussion of the vexing question of substituting a new telegraphic symbol to replace the long dash used for the zero in the Morse alphabet. An infinite amount of trouble and confusion has been occasioned in all telegraphy, but more especially in railroad telegraphy, by mistaking the short dash, which is the Morse symbol for the letter L, for the long dash, which is the Morse symbol for the cipher or zero.

The question is still more confusing for the reason that both the above characters are used in telegraphy as abbreviations of words, which is also the case with the single dot which is the Morse symbol for the letter T. These three characters – — —— are much of the time indistinguishable, either because of the carelessness of the operator or the bad working of the lines. For example, the sticking together of a dot and a short dash can be easily mistaken for a long dash, and the sticking together of two dots can easily be mistaken for a short dash.

This is an old question, and has long been under debate in telegraphic circles. Mr. G. L. Lang, chairman of a committee appointed a year ago to consider this question, reported in an exhaustive address the substance of which was this: That personally he had come to the conclusion that any further committee work in this direction would be inappropriate, for the reason that so far there had been no headway made, and he could not see prospect of any. He recognized the desirability of some change, but had nothing to suggest, and was of the opinion that Prof. Morse had planned his alphabet on such scientific principles that any innovation would be productive of harm. Mr. L. T. Sheldon spoke at length upon this subject, and took the position that the Morse alphabet was in some respects like a language, and you could no more introduce new symbols than you could coin new words. In pursuance of the argument, he cited a number of examples of attempts to introduce new words into the English language. Language grew insensibly, and alterations in the telegraphic language must grow in the same way. Mr. Charles Selden, a member of this committee, spoke upon the subject, but took quite a different view of the subject. He was of the opinion that innovations might be made to advantage in the Morse alphabet, and referred to the action of the United Press, which institution had made many innovations in the Morse alphabet, with good results. In this opinion Mr. C. E. Topping agreed with him, and said that it was humiliating for American telegraphers to admit that there was no remedy for so small an evil.

Mr. Sheldon wanted to know if there was any reason why the English code had never been adopted. Mr. Bogart stated that in the Western Union office a comparative test for speed was made between the English code and the Morse code. At the end of four days the Morse code was 1,728 words ahead.

Mr. Sheldon: "You think the Morse code the faster?"

Mr. Bogart: "Most assuredly, I do."

Mr Sheldon: "Do you think the Morse code can be used with a less number of errors than the English code?"

Mr. Bogart: "Except at a fearfully high speed, I consider the Morse code equally free from error."

Mr. Sheldon: "Do you speak from personal experience?"

Mr. Bogart: "I do. I am equally familiar with the Morse and the English code."

Mr. Sheldon then asked if anybody knew anything about the Phillips code. Mr. Ralph Pope stated that he remembered its being tried many years ago on the Connecticut River Line, and also down East; but it met with no favor.

Mr. Sheldon raised the objection that even if the railroad operators did get a better symbol for the letter L or 0, even then it could not come into general use, because many railroads were under contract to use only the code used by the Western Union Telegraph Company. Mr. W. J. Holmes, representing the Western Union Telegraph Company, spoke to the effect that, if a symbol could be found that would really cause less confusion than the one now in use, there was no doubt that his company would adopt its use. The general opinion of everyone seemed to be the same as that of Mr. Dailey, general superintendent Western Union Telegraph Company, that they really did not know what change to make.

Mr. Sheldon moved that the committee be discharged and the subject dropped. The motion was seconded, but before question was put Mr. Chas. Selden and Mr. P. W. Drew both spoke earnestly and urged the chair that the subject be not dropped; whereupon Mr. Sheldon withdrew his motion. Mr. Selden then moved that a new committee be appointed to still further consider the question and correspond with the various members, and that the matter be left with them for final settlement.

It was finally moved that the old committee be reappointed, but as Mr. Lang declined to serve, Mr. Holmes was appointed in his stead. The committee is now as follows: Charles Selden, Baltimore and Ohio R. R. Co.; C. E. Topping, Long Island R. R. Co.; W. J. Holmes, Western Union Telegraph Co.

Another question which received much attention was the subject of recorders, for the double purpose of being a check on the inaccuracy of the operators, and also that unnecessary messages may be made to pay toll.

A number of gentlemen spoke at length, and the facts brought out showed not only many of the telegrams sent in the ordinary routine of railroad work were unnecessary, but that superintendents often found that their lines were being used to further the in-

terests of rival roads, and a case was cited where thirty telegrams were sent to trace two pieces of missing baggage on another road.

Another source of unnecessary telegraphing seemed to arise from the fact that subordinate clerks oftentimes couched necessary messages in a very unnecessary amount of language, and one gentleman stated that he had had a clerk who always wanted to write a composition when he was instructed to send a telegram about a commonplace matter.

It was the general opinion that it could not be left to the operator to decide if the message was unnecessary. It was the sense of the meeting that the recorder was a coming necessity, and that there should be some way of stopping the enormous amount of unnecessary telegraphing carried on over railroad lines.

Upon motion of Mr. Charles Selden the committee of last year, Messrs. Hammond, Jones and Kinsman, were reappointed to further consider the matter and report at the next annual meeting.

At the close of the session the members and their ladies partook of a sumptuous banquet, and in the afternoon went down the harbor to Nantasket Beach on the steamers Twilight and Rose Standish. Although in the city it was one of the hottest days of the season, yet on the water there was a good breeze blowing.

As the majority of the members are from the West some of them enjoyed a salt water bath for the first time. The ladies were at first timid, but after a good wetting down seemed to enjoy the sport like veteran patrons of Coney Island.

Thursday's Session.

The second session of the convention was called at 9.30 A. M. Thursday.

The meeting came to order at 10 o'clock.

Election of officers for the ensuing year was in order, and Mr. G. L. Lang, of the N. Y. & N. E. R. R., was nominated for president. Upon ballot being cast he was unanimously elected. Mr. Selden then moved that the secretary be instructed to cast the ballot of the whole meeting for Mr. G. C. Kinsman, of the Wabash R. R., for vice-president. The motion was seconded and carried, and Mr. Kinsman was duly elected.

Upon the approved motion of Mr. Sheldon, Mr. Selden cast the ballot of the meeting for Mr. P. W. Drew, of the Chicago & Eastern Illinois R. R., for secretary and treasurer.

Upon retiring from the chair, President A. R. Swift made an eloquent address, thanking the association for the honor they had been pleased to confer upon him during the past year, touching upon the good work before them and the praiseworthy object of their association, and impressing upon his successor the reponsibility of the office he was about to fill.

Upon taking the chair Mr. Lang was called upon for a speech, and in response delivered himself in chosen terms of his thanks to the association for the honor conferred upon him.

An address was made by Mr. M. B. Leonard, to the effect that, in his opinion American railroad telegraph superintendents did not take a proper interest in electrical appliances, not telegraphic, which were used on railroads. Abroad we find telegraphic superintendents receiving the title of electrical engineers, and keeping themselves informed in regard to all electrical devices employed on railroads, and thereby increasing their usefulness and reflecting upon themselves honor and distinction; while in this country we seem to be content with the key and the sounder.

This idea met with the favorable recognition of the meeting, and upon the motion of Mr. Sheldon the chair appointed the following committee on electrical devices: Messrs. S. S. Bogart, L. T. Sheldon, J. B. Shaw, G. C. Kinsman, and T. J. Higgins.

Mr. A. R. Swift brought a matter before the meeting, which, in his opinion, merited notice, as he considered it an element of danger in the railroad community. It is a secret society, the object of which ostensibly is insurance, but which is believed to be an organization which will try to bring pressure upon the railroad companies for higher wages. One of the distinguishing features of this society is that no member shall teach the art of telegraphy to any one who is not a member without permission from the two chief officers, which permission, it is said, will not be granted.

All of the gentlemen present expressed themselves in the strongest terms as utterly opposed to this society, which they looked upon as pernicious in every respect. It was the general expression of several gentlemen who spoke on this subject that they should discharge any operators, no matter how good they might be, who joined this association. Below is given part of the ritual and oath of the organization, which is called "The Telegraphers' Union."

Initiation Ceremony.

When the order of initiation of candidates is reached the C. T. will direct the A. C. T. to ascertain if there are any candidates in the ante-room for the initiation. He will retire, and upon returning salute the C. T. and report as follows:

A. C. T.—Chief telegrapher, the following persons are awaiting the pleasure of the division.

C. T.—The senior and junior telegraphers will retire to the ante-room to propound the usual questions, and prepare the candidate for initiation.

S. T.—Have you ever applied for admission to the order of railroad telegraphers before? If so, when and what division?

Candidate answers.

S. T.—Are you still desirous of becoming a member of our order?

Candidate answers.

S. T.—Are you willing to take upon yourself an obligation of secresy and obedience to the principles of our order?

Candidate answers.

J. T.—No person can be admitted within the portals of our noble order unless he has implicit confidence in the order and its members.

You are requested, as an evidence of your willingness to trust your welfare and interest in our hands, to enter our portals with your eyes blindfolded, thus showing that you believe that we will not lead you into danger.

After some ceremony of entering the inner chamber the applicant is asked the following questions:

C. T.—By what right or privilege do you expect to gain admission to our order? The C. T. will here inform the candidate that as he is yet unable to answer, the conductor will answer for him.

J. T.—By the right of having served his legal apprenticeship as a telegrapher on surface railroad for the period of time and regulations of the order. Candidate will then be conducted to the S. T.

S. T.—In what manner do you expect to be of benefit to this order?

J. T.—By rendering due and strict obedience to all laws, rules, regulations and mandates of the order, by conducting in such a manner as to command the respect and esteem of all who may be interested in the welfare of this order, by keeping inviolate all secrets and workings of the order which may be intrusted to me as such, by doing all in my power to advance the cardinal principles of the order—intelligence, brotherly love and benevolence. The candidate will then be conducted to the A. C. T.

A. C. T.—What induced you to become a member of the order?

J. T.—That I might with their assistance receive a fair compensation for my labor, and thereby be better able to support destitute brothers and sisters.—Candidate will then be conducted to the P. C. T.

P. C. T.—Are you willing to take upon yourself a binding and solemn obligation of secresy—one however that will not conflict with your religion, the duty that you owe to your country, your family or yourself?

Candidate is led to the altar and placed in position to receive the obligation.

I. ———, of my own free will and accord, in the presence of Almighty God and these witnesses, do nost solemnly and sincerely promise and affirm upon my sacred honor, that I always shall and forever conceal all the secrets of the order which have heretofore, shall be at this time or at any future period communicated to me as such, to any person or persons, unless it be a true and lawful telegrapher, or in a regular or constitutional division of the order. That I will stand to and abide by all the rules and regulations of the Grand Divisions, or any local division, so far as shall come to my knowledge. That I will not knowingly wrong, cheat or defraud a brother of this order. That I will aid and assist all destitute and worthy brothers, they applying to me as such. That I will give employment to a brother of this order, when in my power to do so, in preference to a stranger, other things being equal. That I will give a brother member due and timely notice of any danger that I may know to threaten him or his family; and that I will, at all times, and under all circumstances, try to uphold and maintain the dignity of this order. That I will not teach the art of telegraphy to any person whatsoever, unless it be under the sanction of the Grand Chief Telegrapher, attested to by the Grand Secretary, and under the seal of the Grand Division. To all this do I most solemnly and sincerely promise, and affirm with a firm and steadfast resolution, to keep and to form the same, without the least equivocation or mental reservation whatsoever. So help me God, and keep me steadfast.

J. T. removed the blindfold, and members, with right hands extended toward the candidate, repeat in unison, "We are witnesses." The candidate will then be conducted to the C. T.

A member of the press asked if it was the desire of the meeting that the discussion relative to the Telegraphers' Union be made public through the press, and the position was taken that, as the strength of a secret society lay in its secresy, the more public it was made the better.

After a closing address by President Lang, the convention adjourned to meet at New York on the second Wednesday (14th of the month) in July, 1888.

Charging Fraud in the Subway.

The Mayor of New York has been served with an order to show cause why an injunction should not be issued restraining the Board of Electrical Control and the municipal authorities from carrying out the Subway law passed by the Legislature of 1887. Peter McGuinness brings the suit in the Superior Court.

In his complaint he sets forth that after Judge Van Hoesen, of the Court of Common Pleas, decided last winter that the Commissioners had no power to grant an exclusive contract for the construction of the conduits to any company, an act was passed by the Legislature creating a new Board, vesting it with power to grant the contract. The bill, he claims, was not signed by the Executive within the time allowed by the law, and accordingly the law is void. Nevertheless, work is about to be begun on the conduits. He declares that great injuries will be sustained by the city if the thoroughfares are permitted to be excavated by the Consolidated Company. As a taxpayer, he says, he laid the matter before the Mayor and asked him to interfere, but he refused to proceed. He therefore acts on his own behalf, and requests that the act creating the Board of Electrical Control be declared unconstitutional, that the contract with the Consolidated Telegraph and Electrical Subway Company be voided, and that an injunction be issued, restraining the company from proceeding on the basis of the contract.

The order is accompanied by an affidavit of Morgan Hildreth, President of the New York Underground Telegraph Company. He says that the subway Commissioners and the construction company have entered into a corrupt bargain, and the suit now pending in the United States Court, in which Maurice B. Flynn is being sued by William McMahon, is cited as proof. The Consolidated Company, he says, has no intention of compensating the city, and the operation of its lines would injure the city greatly. He adds that it does not even own the patents for the system which it intends to use, and that if it is allowed to proceed in laying the conduits it would only result in a great loss of money, as they would all have to be torn up again.

.... The Merchants' Police and District Telegraph Company, of Covington, Ky., has elected the following Board of Directors: Fred. J. Myers, L. H. Brooks, John P. Ernst, George G. Perkins, Frank P. Helm, O. J. Wiggins and George C. Bramlage. At a meeting of the directors Mr. Myers was chosen president; Mr. Brooks, vice-president; Mr. Ernst, treasurer; and Mr. Bramlage, secretary. Col. Thomas McLaughlin, late of the Kentucky Central Railroad, was made superintendent, and will take immediate charge.

TELEGRAPHIC

.... San Francisco is calling loudly for an electric railway. She will get it in good time, never fear.

.... The Union Electric Underground Company will establish a factory in Pittsburgh for the manufacture of underground wire. Employment for 300 men will be afforded, it is stated.

.... The Board of Aldermen has voted in favor of making a contract with the Brush Electric Light Company for lighting the streets for three years, at $124,500 per annum, and $100 per annum for each extra light.

.... In the United States Court at Norfolk, Va., before Judge Hughes, Mahone vs. Southern Telegraph Company, a decree was entered overruling the exceptions of Henry Carrington's executor to Commissioner Barry's report, and declaring a dividend of 22½ per cent. J. L. McGlove was appointed a special commissioner to pay said dividend.

.... A series of experiments recently made by a French metallurgist are stated to have proved that steel loses weight by rust about twice as rapidly as cast-iron, when exposed to moist air. Acidulated water was found to dissolve cast-iron much more rapidly than steel. This would indicate that steel bridges are less affected by the acids contained in the smoke of locomotives than iron ones.

.... The messenger systems of the American District and Western Union telegraph companies and the Commercial Telephone Company of Troy, N. Y., have been purchased by George P. Ide, Shepard Tappan and A. N. Belcher, of Troy, and some New York capitalists, who propose to establish a new and improved messenger service in that city, probably next month. The control of the messenger departments costs about $35,000.

.... A dispatch from Kansas City says: "The Pacific Mutual Telegraph Company officials have decided to build at once a line from Omaha to Sioux City, Iowa, and another from this city to Denver. They do not anticipate an easy time in the work, as the condemned right of way lies along the railroads, and the Western Union claims to have the sole rights to such ways. It is anticipated here that Gould will contest every inch, and that his men will cut the wires as soon as they are put up. The Mutual has money, and a stubborn fight is not unlikely."

.... Articles of incorporation were filed last week at Albany by the Blue Mountain Lake Telegraph Company, to run a line from Saratoga Springs to Long Lake in Hamilton County, passing through Glens Falls, Caldwell, Warrensburgh, Weaverstown, North Creek, Indian Lake, and Blue Mountain, capital $12,000. The incorporators are Frederick C. Durant, Pneble R. W. G. Welling; the Metropolitan Electric Service Company, of Rye, Westchester County, capital $100,000; the Delaware Valley Agricultural Society, of Walton, N. Y.; the Geschaft Unterehitzungs Vereni, of New York.

.... Lightning has played some strange freaks this summer. It knocked a passenger off the platform of a moving car near Tremont, Pa., and he fell under the wheels and was fatally injured. In Tennessee three ministers and six other persons, attending a funeral, took shelter under a tree and all were killed. Statistics show that the risk of death by lightning stroke is very small, yet every instance is so startling in its character that it makes a deep impression on the mind and inspires a dread of this erratic force out of all proportion to the danger to which it exposes men. There is one lesson that needs to be repeated, however, every summer, and that is, that, in a thunder-storm, no one should seek shelter under an isolated tree or on the edge of woods. If such shelter must be found it should be sought in the heart of woods.

ELECTRICAL AND SCIENTIFIC

* * There are said to be 700,000 miles of telegraph wires in the country.

* * Telephone connection between Somers Point and Philadelphia has been established.

* * Easton, Pa., is to have an electric railroad one mile long. $12,000 has been subscribed for the stock of the company.

* * The Coney Island Rod and Gun Club has introduced electricity as the element to open the traps for their pigeon-shooting tournaments.

* * Electrical industries are continually multiplying, and already employ hundreds of thousands of individuals, and have many millions of dollars invested in them.

* * Oil Size For Oil Gilding.—Grind calcined red ochre with the best drying oil. When desired for use, add sufficient oil of turpentine to make it work freely.

* * The Rae Electric System Company have filed articles of incorporation in the County Clerk's office, San Francisco. Julius Jacobs, A. P. Brayton, Julio Rae, George C. Perkins, and William Alvord are the directors, representing $1,000,000 capital stock, all of which is subscribed.

Fifty Years' Progress in Science.*

Fifty years ago science was still inchoate. Much had already been done by the early pioneers. The ground had been cleared; the building materials had been in part provided; the foundations had been duly and ably laid; but the superstructure as yet had hardly been raised a poor foot or two above the original level. The work of the last half century has been twofold. On one side it has been accumulative merely; new stocks of organizable material—the raw bricks of science—have been laid up, as before, ready to the call of the master mason, but in far greater profusion than by any previous age. On the other side it has been directive and architectonic: the endless stores of fact and inference, thus dug out and shaped to the hand by the brickmakers of knowledge in a thousand fields, have been assiduously built up by a compact body of higher and broader intelligences into a single grand harmonious whole. This last task forms indeed the great scientific triumph of our epoch. Ours has been an age of firm grasp and of wide vision. It has seen the downfall of the anthropocentric fallacy. Cosmos has taken the place of chaos. Isolated facts have been fitted and dovetailed into their proper niche in the vast mosaic. The particular has slowly merged into the general, the general into still higher and deeper cosmical concepts. We live in an epoch of unification, simplification, correlation, and universality. When after ages look back upon our own, they will recognize that in science its key note has been the idea of unity.

In the pride of our hearts we forgot for the most part how very young science still is. We, who have seen that infant Hercules strangling serpents almost from the very cradle; we, who have beheld it grow rapidly under own own eyes to virile maturity and adult robustness of thew and muscle, we forget how new a power it is in the world, and how feeble and timid was its tender babyhood in the first few decades of the present century. Among the concrete sciences, astronomy, the eldest born, had advanced furthest when our age was still young. It had reached the stage of wide general laws and evolutionary aspirations. But geology had only just begun to emerge from the earliest plane of puerile hypothesis into the period of collection and colligation of facts. Biology, hardly yet known by any better or truer name than natural history, consisted mainly of a jumble of half classified details. Psychology still wandered disconsolate in the misty domain of the abstract metaphysician. The sciences of man, of language, of societies, of religion, had not even begun to exist. The antiquity of our race, the natural genesis of arts and knowledge, the origin of articulate speech, or religious ideas, were scarcely so much as debatable questions. Among sciences of the abstract concrete class, physics, unilluminated by the clear light of the principles of correlation and conservation of energy, embraced a wide and ill digested mass of separate and wholly unconnected departments. Light had little enough to do with heat, and nothing at all to do in any way with electricity or sound or motion or magnetism. Chemistry still remained very much in the condition of Mrs. Jellaby's cupboard. Everywhere science was tentative and invertebrate, feeling its way on earth with hesitating steps, trying its wings in air with tremulous fear, in preparation for the broader excursions and wider flights of the last three adventurous decades. The great campaign of the unity and uniformity of nature was the first to be fought, and in that campaign the earliest decisive battle was waged over the bloody field of geology. In 1837—to accept a purely arbitrary date for the beginning of our epoch—Lyell had already published his sober and sensible "Principles," and the old doctrine of recurrent catastrophes and periodical cataclysms was tottering to its fall in both hemispheres. Wholesale destruction of faunas and floras, wholesale creations of new life systems, were felt to be out of keeping with a humane age. Drastic cosmogonies were going out of fashion. But even the uniformitarianism, for which Lyell fought and conquered was in itself but a scrappy and piecemeal conception side by side with the wider and far more general views which fifty years have slowly brought to us. One has only to open the "Text Book of Geology," by Lyell's far abler modern disciple, Archibald Geikie, in order to see the vast advance made in our ideas as to the world's history during the course of the last half century. The science of the earth's crust no longer stands isolated as a study by itself; it falls into its proper place in the hierarchy of knowledge as the science of the secondary changes, induced under the influence of internal forces and incident energies, on the cooling and corrugated surface of a once incandescent and more extended planet. I know no better gauge of the widening which comes over the thoughts of men with the process of the suns than to turn from the *rudis indigestaque moles* of the "Principles" and the "Elements" (great as they both were in their own day) to the luminous, lucid, and comprehensive arrangement of Geikie's splendid and systematic "Text book." The one is an agreeable and able dissertation on a number of isolated and floating geological facts; the other is a masterly and cosmically minded account of the phenomena observable on the outer shell of a cooling world, duly considered in all their relations, and fully co-ordinated with all the chief results of all elder and younger sister sciences.

Evolution is not synonymous with Darwinism. The whole immensely exceeds the part. Darwinism forms but a small chapter in the history of a far vaster and more comprehensive movement of the human mind. In its astronomical development evolution had already formulated itself with perfect distinctness before the period with which we have here specially to deal. The nebular theory of Kant and Laplace was the first attempt to withdraw the genesis of the cosmos from the vicious circle of metaphysical reasoning, and to account for it by the continuous action of physical and natural principles alone. Our own age has done much to cast doubt upon the unessential details of Kant's rough conception; but, in return, it has made clearer than ever the fundamental truth of its central idea—the idea that stars, and suns, and solar systems consist of materials once more diffusely spread out through space, and now aggregated around certain fixed and definite nuclei by the gravitative force inherent in their atoms and masses. As these masses or atoms drew closer together in union around the common center, their primitive potential energy of separation (frankly to employ the terminology of our own time) was changed, first into the kinetic energy of molar motion in the act of union, and then into the kinetic energy of molecular motion or heat, as they clashed with one another in bodily impact around the central core. Each star, thus produced, forever gathers in materials from its own outlying mass, or from meteoric bodies, upon its solidifying nucleus, and forever radiates off its store of associated energy to the hypothetical surrounding ether. The fullest expression of this profound cosmical conception has been given in our own time by Tait and Balfour Stewart, working in part upon the previous results of Kant, Laplace, the Herschels, Mayer Joule Clerk Maxwell, and Sir William Thomson. Deeply altered as the nebular hypothesis has been by the modern doctrine of correlation and conservation of energies, and by modern researches into the nature of comets, meteors, and the sun's envelopes, it still remains in its ultimate essence the original theory of Kant and Laplace. Science has thus, within the period of our own half century, exhibited to us the existing phase of the universe at large in the light of an episode in a single infinite and picturable drama, setting out long since from a definite beginning, and tending slowly to a definite end. Other phases, inconceivable to us, may or may not possibly have preceded it; yet others, equally inconceivable, may or may not possibly follow. But as realizable to ourselves, within our existing limitations, the physical universe now reveals itself as starting in a remote past from a diffuse and perhaps nebulous condition, in which all the matter, reduced to a state of extreme tenuity, occupied immeasurably wide areas of space, while all the energy existed only in the potential form as separation of atoms or molecules; and the evidence leads us to look forward to a remote future when all the matter shall be aggregated into its narrowest possible limits, while all the energy, having assumed the kinetic mode, shall have been radiated off into the ethereal medium. Compared to the infinite cosmical vistas thus laid open before our dazzled eyes, all the other scientific expansions of our age shrink into relative narrowness and insignificance.

*From a paper by Grant Allen in the *Fortnightly Review*.

European Establishment.

In the course of the rapid growth of the business of the New York Belting and Packing Company, manufacturers of rubber belting, packing, hose, and general rubber goods for mechanical purposes in New York, it has been found necessary to establish a branch depot at Hamburgh. Messrs. Persicaner & Co., Pickhuben 5, have been appointed general agents, and will carry a full stock of our well-known goods. Hamburgh is a free port of entry, and will be used as a distributing point for other continental markets.

Telegraph Poles Still Sacred.

The Board of Electrical Control, of New York, held a long meeting last Friday. These are some of the rules adopted about overhead wires:

No two lines of poles shall be on the same side of any street or avenue.

No two lines of poles bearing conductors for similar electrical service shall be on any street or avenue.

Electric light poles shall be of iron at least twenty-six feet in height, with a diameter of not more than eight inches at the base, and having cross-arms of wood, with glass, porcelain or rubber insulators, and painted a uniform color.

Poles for telegraph, telephone, and other similar wires shall be at least sixty feet in height.

No wires shall be stretched within twenty feet of the ground or within four feet of any building, except when attached thereto with glass, rubber or porcelain insulators.

No arc electric light or power wire shall be stretched over any part of any house or other building.

The companies or persons owning or controlling poles in any street or avenue shall allow the same to be used by other companies or persons operating conductors for similar electrical service when authorized so to do by the Board, on tender of proper compensation.

All permits of the Board for overhead wires and fixtures are granted only pending the providing of underground accommodations. No such permit shall be granted for any street in which underground accommodations have been provided or are being provided.

Any pole that shall lie on any street more than two days shall be removed by the Bureau of Incumbrances at the expense of the owner.

The violation of any of the rules shall operate as a revocation of the permit held by the company or person guilty.

Engineer Kearney was authorized to appoint eight inspectors at $4 each per day, whose duties shall be to look after the overhead wires and report their condition. Mr. Kearney also recommended the appointment of a chief inspector at $250 a month. This was adopted, Acting Mayor Beekman voting against.

Again the Western Wizard.

The editor-in-chief, who had just finished reading an article on the lighting of dwellings by electric eels, and another on telegraphing by sound through the ocean, called upon the assistant, and by a few peculiar signs intimated that the season for a second crop of electrical fruit had arrived.

Forty minutes later the door of the seance apartment opened, and the assistant returned with the necessary copy, which reads as follows:

Your reporter called on Ed. Tommasson and found him highly elated with a new invention—or rather, discovery, which, as Ed. has it, "has millions (of bugs) in it;" a witticism which will be better understood farther on.

It was evening, and the room was beautifully lighted by incandescent lamps of a peculiar pattern, with not the semblance of a wire anywhere in sight; and, what was still more remarkable, each lamp was removable, and changed places as readily as an ordinary luminary, and still remained lighted. With the exception of a curious metallic globe, protected by an isolated gauze frame at the middle of the lamp stand, these all bore a close resemblance to ordinary hand lamps.

"Well?" said the reporter, "light up the mystery."

Then the Wizard: "About four weeks or so since, I was lying on the lawn at the west of my castle (joke, see?), near which there is a piece of unreclaimed low prairie. It was evening, and the pale moon rode high, while in the west the diamond like Venus—"

R.—"Is poetry or science your best hold?"

Ed.—"Excuse me, I wander. Over the surface of the pond, which nestles in the midst of that necklace of green verdure, like an 8×10 mirror in mosquito bar trimmings, there danced in the ambient air myriads of beautiful insects, like so many sparks from a job lot of last year's pyrotechnics.

"Why not utilize this wasting power? but how? I thought, and thought! I chalked the floor of my laboratory all over with 'unknowns' and 'infinities,' and other things the average newspaper man knows nothing about. It's just like this——

R—"The insects you say ——."

Ed—"Yes, excuse me. There is always a positive to every negative, you know. Well, I thought if I can separate these and aggregate them + and — and then connect them! Happy thought. I turned the whole household loose in that prairie. We captured a hundred or two, and I set about the investigation. Got well started—got a shock. Investigated. One of the insects had lighted on the top of the pencil I held in my right hand, and while I held a second in my left, I wet the pencil lead to make a memorandum. Carbon's a semi-conductor, you know. See?

"Instantly securing the two, I was overjoyed to discover a radical difference in the structure of the pair of insects. By their size I recognized them as belonging to the male persuasion—you know the female of this insect is more a worm than a bug by the way.

"Last night I continued gathering, and sorted them. And—and—here—right on this very spot I lost a beautiful Gordon setter that unfortunately got into the current, and—and—that—accounts—for—the—smell of burnt hair pervading the atmosphere," and the Wizard opened up a flood of tears that were truly pitiable in quality, abundant in quantity, and full of E.M.F—extract of malt fluid.

The interview was ended.

—— It is stated that the Boulton Crystal and Cleveland Carbon companies of Cleveland have consolidated under one management. This will make a very strong organization.

A Self-Possessed Electric Light Man.

Some good stories are told of Frederick A. Cheney, the genial and able superintendent of the Troy (N. Y.) Electric Light Company, whose handsome form and face are familiar to a great many of our readers.

During the construction of the works and lines at Troy the usual difficulties were met with in the erection of the poles.

One afternoon in South Troy the following conversation took place between Mr. Cheney and a very angry man, in front of whose house Mr. Cheney started to place a pole.

"I will not have this pole put up in front of my house, and if you try to put it up I will set my dog on you."

Cheney, who was smoking a cigar, leaned back against a tree as if in deep thought, and the men all waited to see how the matter was going to end. At last they became impatient, and walking over towards Mr. Cheney, said:

"Have you decided what you are going to do about this pole?"

"Well, boys," said Cheney, "it entirely depends upon the size of that dog; suppose you lead him out here where I can get a good look at him."

On another occasion Mr. C. learned that a man had gone to get an injunction to prevent him from erecting a pole in front of his place. Cheney quickly gathered his men together, and in a few minutes the pole was up, and, just as the last of the dirt was going in around the pole, a carriage came around the corner, and in it was a perspiring man holding a paper in his hand. He drove up to Mr. Cheney and said:

"Hold on, sir! I have here an injunction restraining you from erecting this pole. Now, I see you have it up. What am I to do with this injunction?"

"Well," said Cheney, without a smile, "I am not much of a lawyer, but I should think the proper thing to do with it would be to tack it on the pole."

At another time an angry woman came out with an old rusty axe, and, brandishing it high above her head, walked straight up to Mr. Cheney and said:

"I will give you just half a minute to get away from here with your men; if you don't I will split your head open."

Mr. Cheney glanced coolly up at the axe and then down at the woman, perfectly unconcerned, and said:

"Judging from your physique I should say you could do it with neatness and dispatch, but for decency's sake make it two minutes and get a cleaner axe."

The many and varied trials encountered in the construction of pole lines by electric light superintendents are well illustrated by the incidents in Troy that Mr. Cheney so readily turned in his favor.

Cameron County's Electrical Spring.

The Sizerville, Cameron County, electrical spring, about which so many wonderful things have been said and written, continues to grow in popular favor. A party of Williamsport capitalists have leased it, who will, it is announced, beautify the grounds and erect buildings for the accommodation of the crowds who gather there daily. We were favored on Sunday with a glass of this celebrated water by a gentleman who had brought a jug of it to Ridgeway. It is not unpleasant to the palate, the only peculiarity we noticed being a slight soapy taste. That it is highly charged with magnetic properties is evident from the fact that a knife blade plunged into it will, when withdrawn, pick up tacks and other metallic substances of about that weight.—*Kane (Pa.) Leader.*

An Electric Railway Company.

A company is being organized in Pittsburgh for the purpose of selling rights for electric railway purposes. It is to be called the Overhead Conductor Electric Railway Company, and has a capital stock of $300,000. Among those interested in it are George Westinghouse, jr., John Caldwell, H. H. Westinghouse, Frank L. Pope, and Thomas B. Kerr.

Friedlaender's Portable Lamp.

A portable incandescent lamp and primary battery, devised by Herr Friedlaender, of Berlin, is illustrated in the accompanying figures. The box is made of ebony, measuring 7″×4″×4″, and is divided internally into six compartments, each of which contains a pair of zinc and carbon electrodes. The solution consists of a mixture of chloride of zinc and potassium bichromate, and has the advantage of entire freedom from either fumes or smell. With a lamp of three candle power the solution is said to cost about 2d. per lamp hour. The plates are withdrawn from the cell by turning a knob at the side of the box, which lifts the electrodes out of the solution. Fig. 1 shows the external appearance of the cells, and Figs. 2 and 3 show the internal arrangements.

Electric Light Conduits in Broadway.

Contractor Crimmins' men began late on Saturday night, and continued all day Sunday, when the weather permitted, the work on the electric wire conduit on Broadway from Seventeenth street to Fortieth street. There are no poles along this part of Broadway except those carrying electric light wires, and it is proposed to get these out of the way as soon as possible. Sunday's haste was to get the conduit laid in front of the Fifth Avenue Hotel, where Contractor Baird will soon be along with his new Fifth avenue pavement. The conduit consists of 2½ and 3-inch pipes laid in cement concrete. Seven electric lighting companies, including the East River, are said to be jointly interested in the work.

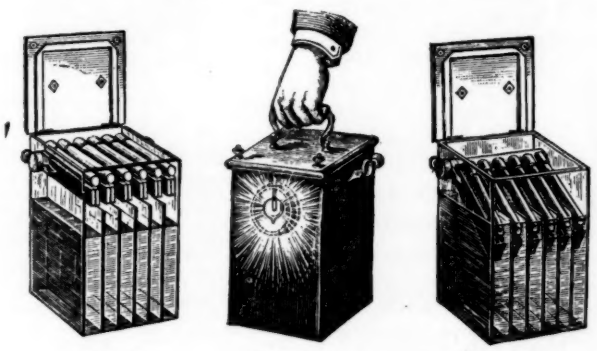

Fig. 2. Fig. 1. Fig. 3.

Friedlaender's Portable Electric Lamp.

The Gas Men Changing Front.

In a paper read before a recent meeting of the Ohio Gas Light Association, the point was made that the gas men might as well acknowledge that the time has gone by when they can, with any serviceability to themselves or to others, cry down the use of electricity as a lighting medium. History, it was said, testifies to the fact that nearly all new inventions have to pass through the ordeal of discouragement and opposition before the world is willing to admit of their stability; but as the electric lighting of to-day gives better satisfaction to the public than it did four years ago, it is evident that this form of lighting has come to stay, and that improvements and economics in it are likely to continuously go on. Realizing this, the author of the paper referred to insists that the gas men should lose no time in utilizing the demand for electricity. They are in the lighting business, and must supply the desires of their patrons, whatever these may be. As a manufacturer who had been making a special kind of goods for a large customer for a series of thirty years would, at the end of that time, deem it the best policy to change the form and style of the goods if his patron required it, rather than let him go elsewhere to purchase his supplies, so the gas companies, if the light consuming public desire to have electricity, should be ready to meet this new demand. Indeed, the authority that we have referred to seems to be of the opinion that this is only the beginning of a change that must take place in the gas business; that the time is coming when all light will be by one form or another of electricity, and that the companies will use their pipes, mains and gas plant generally for supplying fuel gas to the public; for the steam generated for electric lighting only occupies a portion of the twenty-four hours, and the same boilers can be used during the balance of that time in making water-gas for fuel purposes. By this combination it is believed that the dwellers of large towns and cities will be supplied with the best and most convenient forms of light and heat at a minimum of expense,

—— The United States Electric Lighting Company are about to rebuild on the site of their works, corner of Orange and Plane streets, Newark, which were recently destroyed by fire. They are now engaged in tearing down the ruins of the old building. The new buildings are to be of brick, and will be four stories high and will be built in the most substantial manner

—— At Honesdale, Pa., a 1,500 light plant is to be lighted by storage batteries of the Electrical Accumulator Company, through the general agency of L. C. Kinsey & Co., Williamsport. The batteries will be charged by an arc-light dynamo, which will run the arc lights until 12 o'clock, and from that hour till 6 P. M. will charge the batteries. Two men are only required to run the plant, which makes the expense of running, all things considered, very cheap.

—— It is announced that the gas and arc lights at the Baldwin Locomotive Works, Philadelphia, are to be abandoned, the firm having contracted with the Westinghouse Electric Company to install an incandescent plant having a capacity of 2,700 sixteen candle power lamps, on the "alternating system." The actual installation, it is said, will consist of about 1,700 sixteen candle power lamps distributed throughout the various offices and machine shops, and 200 one hundred and fifty candle power lamps in their erecting shop and boiler shop, yards, etc. The service is to be divided among four dynamos located in different parts of the works, and arranged to be either operated independently or together. Switches are to be so arranged that the entire circuits can be operated from either one of the four dynamos in case of emergency, or for watchmen's lights.

Electric Lights on the Streets of Washington.

Twenty thousand dollars was appropriated at the last session of Congress for the purpose of electric lighting in the District. The United States Electric Light Company has filed a proposition with Commissioner Ludlow to place forty electric lights upon Pennsylvania avenue and F street northwest for that amount, and Col. Ludlow told a *Star* reporter that the Commissioners would likely accept the offer. The District will reserve the right to designate their location, and in this connection Capt. T. W. Symons, of the engineer department, has developed a plan to place the lights at the street crossings, one on each corner and a third suspended over the middle of the street. The objection that their light will be hidden by the trees will be obviated by extending the lamps into the streets on brackets or arms.

Graphite Carbon for Electric Lighting.

Mr. H. N. Warren is said to have succeeded in producing a very dense graphitoidal carbon for incandescent electric lighting by passing the discharge from an induction coil through a vessel containing coal gas. The graphite forms on the end of the negative electrode, and lengthens out towards the positive electrode if the latter is withdrawn from the negative electrode. The carbon burns without residue in oxygen. Mr. Warren is engaged in experiments with mixtures of coal gas, and silicon fluoride, or boron fluoride, in order to obtain a denser carbon mixed with silicon or boron, but hitherto has not been entirely successful.

ELECTRIC LIGHT NEWS

—— The St. Cloud Water and Power Company, will erect an electric light plant at St. Cloud, Minn.

—— The Edison Electric Light Company will build a station at Columbus, Ohio, to cost $15,000.

—— The councilmen of Kansas City, Mo., have decided to give the Edison Company a franchise to use conduits for running electric light wires.

—— The city of Washington, D. C., has ordered forty-six additional electrical lights of the U. S. Electric Lighting Company, paying 65 cents a night per lamp.

—— A fire in New Orleans recently caused some damage to the Edison station. The company promptly repaired the damage, and the lights were only cut off for an hour.

—— The Belleville Electric Light Company, of Belleville, Kansas, capital stock, $25,000. Directors, Chauncy Perry, S. C. Crummer, George W. Stevens, M. Noble and E. A. Lyon.

—— Gas Inspector McCarthy, of San Francisco, has refused to audit lighting bills of the California Electric Light Company, and the council has passed a resolution demanding his reasons for such proceedings.

—— The Sierra Buttes Gold Mining Company, of California, has contracted with Mr. R. A. Simon for a 30-light incandescent plant for its mine. If satisfactory results be obtained another plant of 50 lights will be put in at once.

—— The Syracuse, N. Y., Common Council has authorized the Mayor to make a three years' contract with the Syracuse Electric Light Company to furnish 147 additional lights at $12 per month each. The lamp is Thomson-Houston make.

—— The Edison Light Fuel Gas Company, of Grand Rapids, Mich., have purchased property at corner of Calder and Fulton streets, that city, on which they will erect a large building to cover the entire block. Work will commence on stringing wires within the next twenty days.

—— The Huntsville, Ala., Electric Light Company have machinery up and will begin their lights in a few days. A second company, Huntsville Light Company, have obtained right of way and will begin the erection of a plant very soon. The president is Robt. E. Coxe.

—— New Haven, Conn., is well lighted with 420 arc lights. Besides there are some 900 incandescent lamps furnished by the New Haven Company. The station at New Haven is an admirable one, and electric lighting is very popular in the city, greatly due to the excellent work of Mr. James English.

—— The Buffalo street committee has voted favorably on the petition of the Thomson-Houston Electric Company. This petition asked for the privilege of laying its electric light wires underground in the streets of the city. A proposition to compel the company not to charge over 40 cents a night per lamp was voted down.

—— The contracts between the city of Rochester and the Brush Electric Light Company, the Rochester Electric Light Company, and the Edison Electric Illuminating Company were delivered to Mayor Parsons for execution last week. The Brush Company, for which the others had been waiting, signed its contract on Monday, and the other contracts were signed the next day. The three companies will immediately begin to extend their wires and erect their poles under the direction of the lamp committee of the common council, and probably in a few weeks all parts of the city will be well lighted.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JULY 12, 1887.

366,202 Apparatus for measuring electricity; Jules Cauderay, Paris, France.

366,209 Electrical conductor for railway trains; Augustus L. Duwelius, Cincinnati, Ohio.

366,212 Electrical alarm; James A. Galvin, Steelton, Pa.

366,229 Telegraphy; Louis Maiche, Paris, France.

366,263 Underground cable for telegraph wires; Robert F. Silliman, Troy, N. Y.

366,267 Automatic regulator for electric motors; 366,268, Electric meter; William Stanley, jr., Great Barrington, Mass., assignor to George Westinghouse, jr., Pittsburgh, Pa.

366,292 Car-lighting apparatus; Craig R. Arnold, Sharon Hill, Pa.

366,305 Galvanometer; Harry B. Cox, Cincinnati.

366,324 Automatic electric temperature regulator; Warren S. Johnson, Milwaukee, Wis.

366,336 Compound for covering electric wires; 366,337, Semi-elastic compound for covering electric wires, etc.; Henry W. Merritt, Somerville, assignor to William H. Ireland, Boston, Mass.

366,347 Electrical converter; Albert Schmid, Allegheny, assignor to George Westinghouse, jr., Pittsburgh, Pa.

366,349 Regulator for self-exciting alternate current electric generators; 366,350, Safety strip for electric circuits; Oliver B. Shallenberger, Rochester, assignor to George Westinghouse, jr., Pittsburgh, Pa.

366,352 Incandescent electric lamp; 366,353, Process for making incandescents; Edward P. Thompson, Elizabeth, N. J.

366,361 Electric conductor; 366,362, Electrical converter; George Westinghouse, jr., Pittsburgh, Pa.

366,374 Circuit controller for electric circuits; Henry M. Byllesby and Philip Lange, Pittsburgh, Pa., assignors to George Westinghouse, jr., same place.

366,375 Electric converter; Henry M. Byllesby, Pittsburgh, Pa., assignor to George Westinghouse, jr., same place.

366,376 System or circuit for electrical distribution; Henry M. Byllesby, Pittsburgh, and Albert B. Shallenberger, Rochester, assignors to George Westinghouse, jr., Pittsburgh, Pa.

366,400 Telegraph key; Alphonso S. Keating, Corry, Pa.

366,407 Electric switch; 366,408, Core for electro-magnets, and method of forming the same; 366,409, Electric galvanometer; Philip Lange, Pittsburgh, Pa., assignor to George Westinghouse, jr., same place.

366,410 Electric galvanometer; Philip Lange, Pittsburgh, and Oliver B. Shallenberger, Rochester, assignors to George Westinghouse, jr., Pittsburgh, Pa.

366,457 Laying continuous electrical conduits; Alexander C. Chenoweth, New York, N. Y.

366,513 Electric controlling and regulating device for pendulums; Willam S. Scales, Somerville, Mass., assignor to the Synchronous Time Company.

366,523 Automatic regulator for electric distribution; William Stanley, jr., Great Barrington, Mass., assignor to George Westinghouse, jr., Pittsburgh, Pa.

366,544 Electrical converter; George Westinghouse, jr., Pittsburgh, Pa.

366,599 Incubator; Gustave A. Muenchinger, Newport, R. I.

366,603 Mast-arm for electric lights; Frank H. Parker, Burlington, Vt.

366,606 Key socket for incandescent electric lights; Frank S. Pope, Elmora, N. J., and Henry M. Byllesby and Philip Lange, Pittsburgh, Pa., assignors to George Westinghouse, jr., Pittsburgh, Pa.

366,613 Electric arc lamp; 366,414, Electric arc lamp; Addison G. Waterhouse, Hartford, Ct., assignor to the Waterhouse Electric and Manufacturing Company, same place.

366,628 Type-wheel for printing telegraph receiver; Clarence S. Healy, Brooklyn, assignor to the Commercial Telegram Company, New York, N. Y.

366,634 Electric switch; Roderick Macrae, Baltimore, Md., and Charles F. Tavener, Boston, Mass., assignor of one-third to Peter Deveney, Boston, Mass.

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"In making the statements which follow we can verify each and all of them as facts. Mr. Edward P. Thompson, of Temple Court [7 Beekman St.,] New York, is a good man to bring your patent cases to, for he is thoroughly versed in all the ins and outs of a Patent Attorney's duties. The following are some of his qualifications: Graduate of Stevens Institute as Mechanical Engineer. For four years tutor of classes of young men in mathematics and experimental physics at Elizabeth, N. J. Served professionally as Electrician and Chemist in the Swan Electric Company of New York for two years. Because of past successes as a Patent Attorney at 13 Park Row, New York, was appointed, to succeed N. S. Keith, of the patent agency of the *Electrical World* and Associate Editor. N. S. Keith is known as the Translator and Reviser of Schellen's Treatise on "Dynamo Electric Machinery." Mr. Thompson for two years personally prepared and prosecuted all the patent business of *Electrical World*'s Patent Agency, and is the author of a series of articles in said paper upon "Analytical and Systematic Method of Inventing," which were widely known and favorably received. Mr. Thompson is a member of American Institute of Electrical Engineers and American Society of Mechanical Engineers. He is author of the "Expansion of Polynomials," which the ablest mathematicians of the world universally commend." —*New York Observer.*

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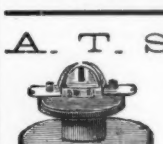
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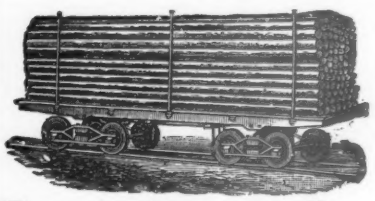
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